A NOVEL ENHANCED CLOUD-SaaS FRAMEWORK FOR CONTROL OFFICE APPLICATIONS

Dr. M. Manimekalai

Director and Head,
Department of Computer Applications,
Shrimati Indhira Gandhi College, Trichy
Tamilnadu, India

R. Raghuraman

Principal, Zonal Railway Training Institute,
Southern Railway, Trichy
Tamilnadu, India

Abstract— **Technology plays a vital role in each and every part of the world. In particular "Cloud" computing - a moderately recent term, which characterizes the paths to develop the advancement in the world of computer science. Because of this the technology has development in the field of IT industry now. Further, Cloud provides an affordable environment for its users and different services such as SaaS (Software as a service), PaaS (Platform as a service), and IaaS (Infrastructure as a Service).**

Firstly, a software application is authorized by the software provider and that can be purchased and used on demand in SaaS model. Accordingly, this kind of service is run on cloud and various end users are effectively using it. In the world of global development, the Indian Railways has turned out to be one of the most important organizations in creating revenue through transportation. The first operations were started in the year 1853, and the network of the Indian Railways has grown so widely that it has become the most popular transportation system all around the country. Moreover, it is true that the organisation has captivated the progress of railway technology in tune with the requirement of moving large volumes of passenger and freight traffic.

The operational hub of Indian Railways consists of 68 Divisions and 9 Area Control Offices which are directly associated with monitoring the running of passenger and freight services. Train operations on the Indian Railways are controlled and monitored by the Control Rooms in each of the seventy seven divisional/ area control offices. The Control Room is the nerve centre of the division. The fluidity of train movements over the jurisdiction of the division is dependent on the efficiency of the Control Room operations. The Control office, by its very nature never shuts down and works all hours of the day and every day of the week. The Control Office Application (COA) has changed the way the trains are monitored as train movements are captured in real time and movement of scheduled and unscheduled trains planned and controlled through the computer aided interface.

The Control Office Application (COA) is the latest addition to train operations related IT applications. Along with Freight Operations Information System (FOIS), COA has led to all information on train operations being computer generated. It is this application that feeds the National Train Enquiry System (NTES) that provides passengers up to date information on train running. COA also provides train operations information to FOIS and ICMS also. The objective of the Indian Railways is to further improve the operations by using technological aids that enable quicker data capture and intelligent applications that provide better planning and forecasting tools. To overcome these issues, in cloud computing, we can use SaaS (software as a service). In this paper, we have a created structure for a software module to solve issues of hardware, software, server and agents. It is felt that the proposed software module can be installed in the cloud for the better performance of COA.

Keywords-COA, SaaS, PaaS, IaaS. FOIS, NTES

I. INTRODUCTION

The Software is becoming more important tool for performing the smart work. In that Cloud computing environment [1] gives internet based platforms which are used for the development of computer technology. The several of computing concepts are dealt here. Around the new technology, the innovative envelope is "Cloud". The resources are collected and managed automatically in the cloud computing. The personal and public information are stored on the cloud computing where the world relies at present [2]. For each and every user the main requirement is the Cloud computing, and according to the users' needs, the relevant services, hardware and software is provided. Through the rapid growth of the Internet, the requirement of user's is realized with their needs which are different and changing. An extension of the parallel computing, grid computing and distributed computing is the cloud computing. It has taken up a central role for providing computing service, convenient data storage, secure and quick software development environment. Many Companies that might be measured as the giant of software industry like Microsoft are amalgamating to develop Cloud services. From any network device, all the data and application can be accessed in safe and secure manner on the cloud computing environment [3]. The following are types of cloud [17]:

A. Private Cloud

This Private Cloud is also called as on-premises [4] or an internal Cloud. This is administered and controlled by a single organization or a group where it is also termed as on-premise

cloud or an internal cloud, the cloud which is held by the same organization and which gives a limited access to its services to the consumers and resource in private cloud. The privacy, governance and security are maintained by controlling the consistency level when only one organization is operated and managed by the infrastructure provider.

B. Public Cloud

The term Public Cloud is also popularly named as cloud of multitenant or external cloud [5]. It is open and commonly used by general public. A combination of organizations or government organizations own and manages the cloud. It is referred to as multi-tenant cloud or external cloud, an explicitly available model in the cloud environment is represented by this model and it can be accessed by general public. The Customers can access resources and pay for the operating resources. Public Cloud can host individual services as well as collection of services.

C. Community Cloud

It has transformed to a unique purpose of cloud environment which is shared and managed by a number of related organizations and it is contributing in a common platform or vertical market. The common concerns like compliance, security, governance etc is shared in a community by many organizations and this model is deployed in the sharing of resources. In a vertical market or common domain, the participation of numbers of related organizations which is shared and managed by the special purpose cloud is generally referred to as community cloud [6].

D. Hybrid Cloud

The cloud infrastructure like private, public or community are already known and this type of cloud is a combination of any two or more but is bound together and the application portability and data is standardized which has enabled this technology. The merger of the private and public is called as a hybrid cloud [7]. It provides the benefits of multiple deployment models. It facilitates the venture to manage consistent state of workload in a private cloud.

The Control Office Application is a complex application which caters to the complete load of a Division responsible for running 100's of trains every day [8]. The application is centred around validation of a large chunk of referential data about stations, sections, trains, locomotives, coaches, wagons, running characteristics etc and the response time envisaged is less than a milli second to facilitate advance planning of following movements based on the running characteristics of the train and the infrastructural constraints. In this present experimental method, it is attempted to introduce our software module which would reduce the cost of software maintenance and hardware requirements by migrating the application to the cloud.

II. SOFTWARE AS A SERVICE (SAAS)

A software application is authorized by the software provider and that can be purchased and used on demand in SaaS model [9]. This type of service is run on cloud and multiple end users are using it. Mainly, it runs on web browser e.g. Gmail- a popular SaaS product. And also generally it is billed based on usage and have multi tenant environment. The application(s) can be accessed through the network from various clients (web browser, mobile phone etc). Further, it does not involve any client installation or network connectivity but can be accessed through any client device or browser [10]. A single user can alter the configuration setting option in the traditional enterprise software like an application customization on the SaaS which also provides the application support for the configuration option and enable every user to have his/her own configuration option setting. The applications were considered and it is tailored to the degree on the basis of the set of predefined configuration options. On a cloud infrastructure [17], the competence provided to the customer is to employ the provider's applications to run it. Through the thin interface of client like web-based email from various clients, the application can be accessed. The configuration setting is of exception to limited user-specific application and the following capabilities like servers, storage, operating system, network or capability of an individual application [11], which are underlying on the cloud infrastructure and these are not managed or controlled by the users.
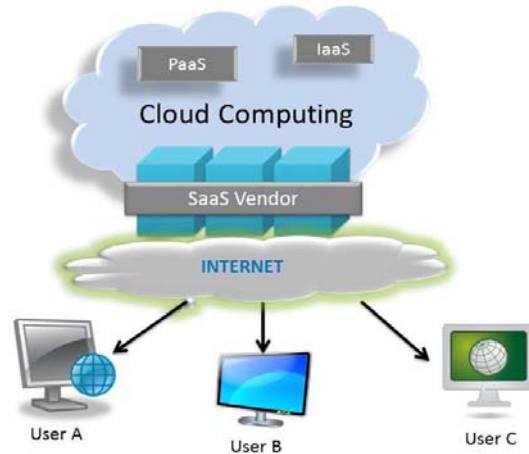

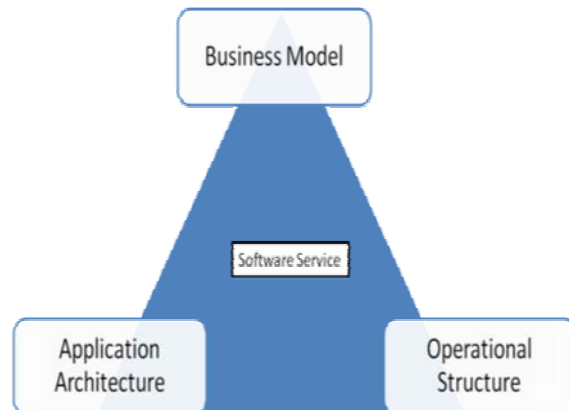Figure 1: Cloud Software as a Service

Figure 2: Software Service used in many applications

III. SOFTWARE LICENSING IN THE CLOUD ENVIRONMENT

All software is free in many dreams of a world. In the real part of the world, however, software authorization [12] is not leaving us any time soon. For that many companies have to spend enormous resources in researching, developing, and supporting the high quality applications, which should recover that investment. Being an end user, we have to decide as to whether to search for a free alternative or for using a proprietary software by paying to a vendor when there is sufficient value for that or go in open source that suits our needs. In the present and future, the end use of an application becomes the deciding factor to go for commercial software. It may be noted that the use for an application at present and future is a vital consideration in the software licensing. The following are the important types of licensing of the software [17] in the cloud:

A. Perpetual Software Licensing

With certain conditions and terms, it makes you to work an application as long as you wish in the form of software licensing [13]. It varies in the limitations like how many or who may use the software. Even If you decide to stop paying for the software, you can continue to use the application and upgrades and technical support is provided by some vendors.

To the cloud computing, the software licensing is user friendly and it is very trouble free and unique. The activity with two traders i.e., application vendor and cloud vendor should be managed when an end-user has subscribed to an IaaS (Infrastructure as a Service). The most of the product update (when an application is accredited in a SaaS (Software as a Service) is delivered by a cloud service provider. While calculating ROI on this model, the activity becomes more multifaceted and full of insecurity, requiring a bit of a "leap of faith". As a result of this, the outcome is for using the software is paid by your customers, and in turn you should reimburse the vendors for what is essentially inventory.

B. Subscription Software Licensing

The A user friendly way for licensing software to cloud computing applications is the payment. In this software licensing, for peak current users, the vendors is charged for the devices that are accessed by the user's need and it is also mingled in this genre of software licensing [14]. In nature, Cloud service providers desire to pay in arrears, because that's how they bill their customers. The metered usage is reported back to the software vendors by the service providers for a period of time the end users consume the resources and it is done in this method.

In addition to this, the market has the traditional software companies which are actively promoting subscription licensing. In general, subscription software licensing costs is more for its eternal numbers over some period of the time. However, the end users are benefited with happy mind where they frequently use a fully supported and updated copy of their favourite applications, without any huge investment.

The subscription software licensing is quite sensible when the cloud service provider is your application vendor. For the cloud service providers, to use the model for a long period, the licensing subscription should be in terms of pay per use.

C. Pay-Per-Use Software Licensing

The pay-per-use software licensing is not favourable to the customers when the cloud service providers are "Nirvana". For the metered usage of their products, the payment is done in arrears by the software users in this model. The infrastructure and application cost is included in what the customer pays for the service availed. There is no need for predicting the entire stack that already exist and which uses the same model by the cloud service providers.

For products and services, the customers are locked by means of yearly commitments in the Massive Enterprise License Agreements and obviously, conventional software vendors are very defensive [15]. It is sure to get more revenue when the pay-per-use is disrupted by this model. Like an infrastructure, the software also costs less to buy than to rent for the full time.

IV. PROBLEM DEFINITION

Before In the existing Control Office Application (though division centric), the defined features provide for interfacing with related applications like Freight Operations Information System (FOIS) to update the relevant information on running of freight trains and with National Train Enquiry system (NTES) to provide real time information to the customers on the running of passenger train services. These are highly network centric features and may lead to lot of customer dissatisfaction in the event of breaking of links. It is therefore attempted to develop a module software for being hosted on the cloud which would help to overcome the functional limitations of the existing software.

V. WHY MOVING TO SAAS (SOFTWARE AS A SERVICE) CLOUD

1. Self Service on demand: For managing the own computing resources, the customers' requests for the services is called as Self service on demand [16].The services are provided by a cloud provider for the customers who request for managing their resources over the internet. 2. Pooling of Resource: With the effort at minimum level, the rapid provision of resources pool is shared by the Cloud computing [17]. Using the remote data centres, the resources are drawn by the customers. 3. Elasticity: Over the internet, the services are provided on the cloud computing. As per the requirement of customer, the services are provided and managed from the cloud provided for the service request given by the customers and it may be larger or smaller from time to time [15]. 4. Measured Services: For a definite services according to the customer demand, the billing of services takes place here. [17]. As customers can request for services as per their own requirement, services are billed according to customers demand. The following are the benefits of SaaS [9] [17] in the cloud environment.
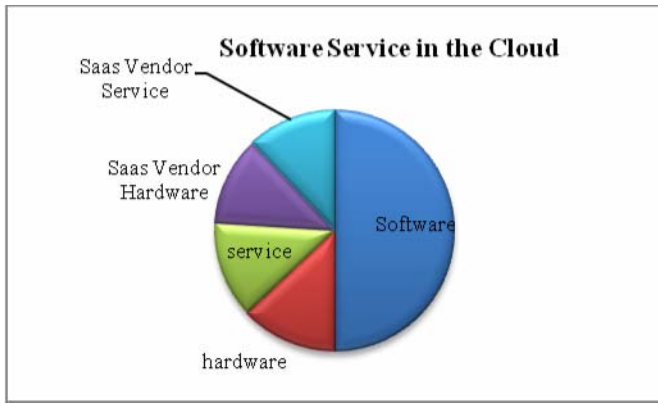
Figure 3: Software in the Cloud environment

The following are the characteristics of the Saas in the cloud environment [18]:

- Web access to the commercial software
- Software is managed from a central location
- Software delivered in a "one to many" model
- Users not required to handle software upgrades and patches
- For integrating the different pieces of software, the Application Programming Interface (API's) is allowed.

VI.   PROPOSED SOFTWARE FRAMEWORK

In the cloud environment, our proposed software framework is implemented to avoid the inconvenience of the user who would be using the COA functional features. In the software, we are providing the access control: only the authorized user can operate our software in the cloud, COA management: it manages and monitors the train movement in real time and the trains for scheduled and unscheduled planning, agent management is to work for the different needs of the user like accommodation, tourism etc, and the stamping is used to carried out the payment by the user for their travelling convenient. These access control, COA management, agent management and stamping are comes under the service delivery platform runtime. The security logs for the access control and database is maintained for the users and managing logs are done by this software.
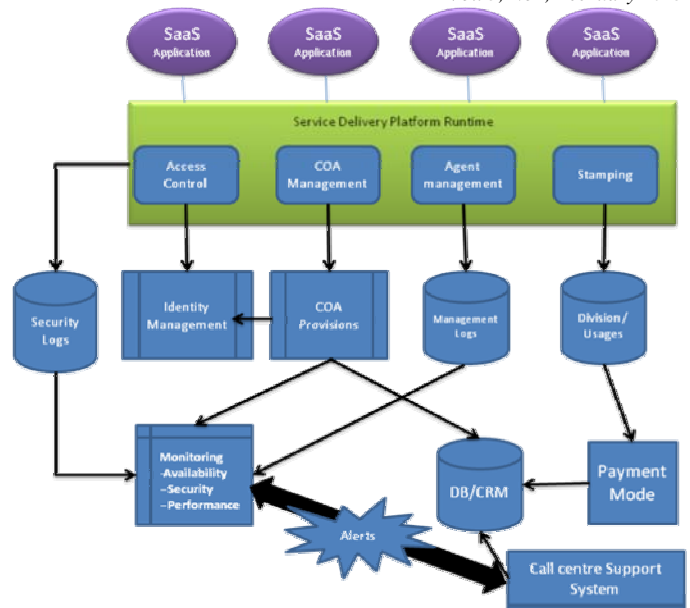

Figure 4: Proposed Software Framework for IR in the Cloud Environment

VII.   RESULTS BY OUR SOFTWARE FRAMEWORK

By our software framework, there is no chance for the hardware problem like in the conventional method of railway booking method. In our software, the agent problem in the conventional method is reduced. The software implemented in the cloud, there will be no issue of server problem, and it is user friendly because we can access that any time and everywhere. The software in the cloud is available at any time for the user and it makes the user to use in comfortable manner. The following table gives the result of our proposed method.

Problems	Previous Framework	Proposed Framework
Software	✔	Reduced than the previous
Hardware	✔	Reduced than the previous
Agent Problem	✔	Reduced than the previous
Server Problem	✔	Reduced than the previous
Availability	✔	Reduced than the previous

Table 1: Result of our proposed software framework

VIII.   CONCLUSION

There is a cause for the shared services due to their matured services and the internet reliability and these are provided by means of cloud computing. The management effort is minimum and with the rapid provision or interaction of the service providers, the configurable computing resources of shared pool by the network access of on-demand services and convenient model is enabled by means of only cloud computing. In cloud computing, Software as a Service (SaaS) where software implemented in the cloud environment can be accessed from various users through browser, mobile phone etc by the application use. By implementing our software framework in the cloud, we can have distributed geographical agent centres; the usage of resource can be independent to the user of our software in the cloud. And our software framework

is a multiple application subsystems, Control Office Application management; access control, call centre support system are incorporated in the software itself, therefore there will be no chance for agents server problem or availability problem of the agents.

REFERENCES

[1] **"The Standardisation Environment for Cloud Computing"** - An analysis from the European and German point of view, including the 'Trusted Cloud Technology Programme, Federal Ministry of Economics and Technology, pp.no: 1-20.

[2] Alexa Huth and James Cebula, "**The Basics of Cloud Computing**", The NIST Definition of Cloud Computing, pp.no: 1-4.

[3] Dejan Kovachev, Yiwei Cao and Ralf Klamma, "Mobile Cloud Computing: A Comparison of Application Models", pp.no:1-8.

[4] Shyam Kumar Doddavula and Amit Wasudeo Gawande, "**Adopting Cloud Computing: Enterprise Private Clouds**", pp.no:1-9.

[5] Wayne Jansen and Timothy Grance, "**Guidelines on Security and Privacy in Public Cloud Computing**", National Institute of Standards and Technology , pp.no:1-52.

[6] Gerard Briscoe and Alexandros Marinos, "Digital Ecosystems in the Clouds: Towards Community Cloud Computing", pp.no:1-7.

[7] "SECURITY IN THE HYBRID CLOUD: Putting Rumors to Rest", pp.no:1-10.

[8] Man Mohan Swarup, Abhiram Dwivedi, Chanchal Sonkar, Rajendra Prasad, Monark Bag, Vrijendra Singh**, "A QR Code Based Processing For Dynamic and Transparent Seat Allocation in Indian Railway",** IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 3, No 1, May 2012, pp.no:338-344.

[9] S.Satyanarayana, "**CLOUD COMPUTING : SAAS**" GESJ: Computer Science and Telecommunications 2012|No.4(36), pp.no: 76-79.

[10] Philippe Botteri, David Cowan, Byron Deeter, Adam Fisher, Devesh Garg, Bob Goodman, Jeremy Levine, Gary Messiana, Anil Sarin, and Sarah Tavel, " **Bessemer's Top 10 Laws of Cloud Computing and SaaS**", pp.no: 1-14.

[11] Catherine Spence, Jason Devoys and Sudip Chahal, "**Architecting Software as a Service for the Enterprise**", At Intel, pp.no: 1-10.

[12] Malcolm McRoberts, "**Software Licensing in the Cloud Age- Solving the Impact of Cloud Computing on Software Licensing Models**", The International Journal of Soft Computing and Software Engineering [JSCSE], Vol. 3, No. 3, pp.no: 395-402.

[13] "**Software Licensing in the Cloud:**How much leverage are you giving up?", Software Contract Solutions, pp.no: 1-7.

[14] Gary Matuszak, "Building a Successful Cloud Provider Service-Accounting and Tax Consideration", pp.no: 1-28.

[15] **"Cloud Computing and Trusted Storage",** Promise Technology Inc, pp.no: 1-8.

[16] Pierre Riteau, Myunghwa Hwang, Anand Padmanabhan, Yizhao Gao, Yan Liu, Kate Keahey and Shaowen Wang, "**A Cloud Computing Approach to On-Demand and Scalable CyberGIS Analytics**", pp.no:1-8.

[17] Kuyoro S. O., Ibikunle F. & Awodele O., "**Cloud Computing Security Issues and Challenges**", International Journal of Computer Networks (IJCN), Volume (3) : Issue (5) : 2011, pp.no: 247-255.

[18] Sarbojit Banerjee, Shivam Jain, "A survey on Software as a service (SaaS) using quality model in cloud computing", International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 3 Issue 1, January 2014 Page No. 3598-3602.