# Survey on Implementation of E-learning System Using Cloud Solutions.

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*Abstract*— **For rapid and optimum project development of Enterprise Application, many industries prefer Framework based structure and IaaS(Infrastructure as Services) which depend upon cloud service providers such as Amazon, Google, Microsoft. This paper presents Comparative study of different Frameworks integrations for finding suitable and efficient frameworks integrations for e-learning application according to pros and cons of respective framework integration. We can arrange Model-View-Controller architecture accordingly, for sophisticated way of implementation and easier modification. Different Clouds provides pay and use services which are more efficient for saving cost of maintenance and thus reduces extravagance. We present study on Amazon services like EC2, SQS and S3 in the consideration of parameters of Reliability, Availability and Security. For e-learning there is dynamically and rapidly changing data model concomitants with high upload rate of files and efforts to evolve suitable services for e-learning architecture shall be prime focus of discussion. With the objective evaluation of above discussed points it can be concluded that E-learning model, with localized and decentralized needs , fetching appropriate services from Amazon infrastructure in optimum extent is highly possible.**
*Keywords*— **Struts, Spring, Hibernate, IaaS, Deployment Models.**

## I. INTRODUCTION

In today's world, J2EE platform is most frequently used by industries for advantages parameters of security, reliability, rapid development, stability and maintenance[2].But for web based system and web services many industries prefers framework based architecture for increasing efficiency and maintenance. Many e-commerce, e-business, e-learning application have developed using light-weighted "three-tire-architecture". A frameworks integration system uses Model-View-Controller mechanism by which highly weighted enterprise application converted into light weighted separation for layers. It removes problem like heavy development burden, Hard to understand logic, redundancy of code by optimum use of framework [1]. By using Object Relational tools like hibernate, EJB, EBin problem on slower accessing data is reduced with minimum efforts developer effectively interact with Database. We analyze study of various frameworks integration and improving and changing methods according to issue founds.

Web based E-learning is new trend in education, which overcomes drawbacks of traditional education system and client-server application. It satisfies need of various factors in education domain and provides quality of education. There different cloud computing service providers which provides Infrastructure as Service for e-learning system such a Amazon,Google,IBM,Microsoft,Yahoo[3].We discuss about various solution provided by cloud service providers for e-learning domain and suitable instances for e-learning system deployment. Each services providers having difference instance for holding data and managing transactions which are differ in cost.

In following section we discuss about different frameworks, there features and effective use in model-view-controller tier. For e-learning deployment we study model available for deployment and provides Infrastructure as Service and there prose and cones with various instances of some service providers and concluded suitable cloud in stances and resources require for to mid way Enterprise application.

## II. LITERATURE SERVE.

Jiya Jiang, Tong Liu,Yu Liu[2] proposed E-business System can be constructed by using Model-View-Controller Architecture rather than using J2EE Platform. Model contains business data, business Object and Business logic ,View contains information required for interacting with user and Controller which handles the action and passing data as well as request from view to Model and vice versa[2]. View layer implemented by struts1.3, It manages all the configuration using Strut-config.xml. Which support others frameworks like spring, Hibernate and JDBC. In this merchandise manager interact with system and follows flow of request passing from presentation layer which checks all the validation after it confined using web layer which realizes action and forwards to Service layer to execute specific action. In DAO tire by using persistence object, ORM frameworks update data from database. In that E-Business portal, B2C systems developed by three-tier-architecture which is Struts1.3, Spring2.0 and Hibernate. It satisfies demand of each customer by maintaining clear, simple and modular structure of system architecture. Specialty of MVC is there is no needs of J2EE Server open source frameworks are sufficient for portal [2].

TABLE I
COMAPRATIVE STUDY OF SPRING, STRUT AND HIBERNET FOR MVC

| Framework | Features | Advantage | Limitation |
|---|---|---|---|
| Strut 1.3 | • Merge of Web Work,<br>• MVC Design Patten<br>• Heavy weight,<br>• Integrate with JSTL Expression Language | • Automatically Exception handling,<br>• Database link pool management | • Separate request Processor with same lifecycle<br>• A synchronization model |
| Strut2.0 | • merge of Web Work,<br>• MVC Design Patten<br>• heavy weight,<br>• Integrate with Object graph Notation Language | • Exception handling, Database link pool management<br>• Different request processor with different life cycle,<br>• Thread Safe Synchronization model | • Reconfiguring,<br>• Weak indexing, |
| Spring | • IoC container,<br>• Transaction management ,<br>• Loosely coupled.<br>• Spring Object Relational Mapping | • Enable the use of EJB ,<br>• Light-weighted architecture\ with support for Tag Library,<br>• Controller implementation Based Easy for switching platforms,<br>• Flexible handler mapping and model transfer | • lack of a common controller,<br>• Rich Selection of controller,<br>• Formation for vendor-specific implementations of libraries |
| Hibernate | • persistence framework<br>• Session management<br>• Transaction management<br>• Entity management<br>• Detached entities | •<br>   Supports Inheritance, Associations, Collections, contains all relationships<br>• Database Independent<br>• Fast performance by supporting catching mechanism and annotation | • More API to learn<br>• debugging some more difficult<br>• Slower than JDBC |

Chunsheng Zhao, Mai Jiang, Zhiyong He [1] presented E-Commerce system in which Struts 1.3 integrates with JSTL, so it uses the JSTL EL. The EL has basic object graph traversal, but relatively weak collection and indexed property support. While in Strut 2 it removes by using more powerful and flexible expression language called "Object Graph Notation Language" (OGNL).Which provides high indexing property support. E-commerce application can be designed using integrating three Frameworks which are Struts 2, spring, Hibernate. Struts2 has powerful web performance processing mechanism, Spring Framework used for decoupling the complex business logic and business object, ORM framework Hibernate focus on data object's O/R mapping and persistence. All Components fulfills request Duties as follows [1]

*A)  Web presentation layer-*

Strut2 mechanism is used for presentation layer to interact with external user. It work on principle of aspect oriented programming  it uses presentation and core model layer  based on OGNL and values stack mechanism. Strut 2 filter dispatcher mechanism searches request in strut-xml file and forwards the specific request to Spring Container. It also contains Ajax for user convenient, CSS for page designing,

Client side validation handled by JavaScript. The corresponding international appropriate documents

(*.properties) and controller forwarding document (struts.xml) configured in processing flow of presentation layer[1].

B)  *Business Logic layer-*

It contained all business operations, business data and business objects which divided into several abstract and implemented layers. This layer implemented in between presentation layer for interaction and data persistence layer. Spring is responsible for assembling and instantiating business logic performance action in presentation layer, assembling and dividing business logic service and the transactions between businesses in business logic layer, DAO layer. It calls Hibernate Template to persistent data objects in data persistence layer [7].

*C)  Data Persistence Layer and Domain Model Layer:*

For Efficient and faster accessing the database, it stores the domain object to database and performing the operation on the data object. Web tool like hibernate having its own algorithm to data object operation. Hibernate provides its own API, commands and easy to use hibernate template. Data processing becomes faster and efficient by using HQL and Criteria query and different database can be integrate using .hbm file of hibernate this seems to be very effective when system migrates form one Database to other. Domain model layer contains business object which act as carrier between different data layers.  Reusing a business object is main focus of implementing domain model layer [1].
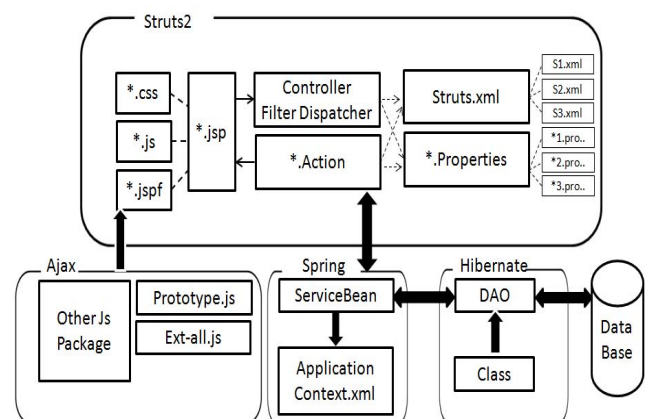


Fig. 1.Example Integrated Framework Flow

Ankur Bawiskar[3] Constructs University management System with help of by using multitier Architecture of MVC framework in which University student interact with system by using view layer implementing using Strut 2,by enrolling into system it uses available facility like downloading papers and other e-learning facility. The Spring framework uses easily integrated with any other ORM tool such as Hibernate with the help of XML mapping and also with iBATIS. Spring 2.0 also integrating with Strut 2.0 framework and forming interactive API [4].Comparative study of frameworks which is shown in Table I. and Flow is generated as shown in Fig 1.

## III. CLOUD COMPUTING SOLUTIONS FOR E-LEARNING SYSTEM

Now a days with the significant growth in the cloud based system so many industries gives their attention towards the cloud computing solutions. E-learning is promising application area since its typical requirement coincides well with the cloud characteristics as it contains properties like dynamically allocation of computation and storage resources [8]. In this paper we represent some possible cloud solution for an E-learning System with emphasizing its possible pros and cons. It is of paramount importance to choose most suitable cloud model for an E-learning application in terms of scalability, portability and security, there are different deployment alternatives of cloud computing and their benefits [8].

Internet technologies recent progress gives us opportunities to access the environment that allows users to run and access their applications. This environment contains data center that are monitored and maintained by content providers [9]. There are two main points in cloud computing technology mainly interactivity and collaboration [10]. Cloud Computing enables 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 efforts or content providers interaction[11].

There are three cloud deployment modules in the cloud market

1) Public Cloud: This model is used by the general public cloud customer in which the cloud service provider has the full ownership with its own policy, value, and profit, costing and charging model and it is most common model of cloud computing [12].
2) Private Cloud: This cloud is operated within single organization and managed by organization or third party regardless whether it is located premise or off premise [12]. Security and privacy concepts enforce most of the organization to use this model.
3) Hybrid Cloud: This Cloud Infrastructure is combination of two clouds i.e. public cloud or private cloud but that is bound together by standardized technology which enables data and application portability [12].

A) Overview of cloud based E-learning System:

Many education organizations do not have sufficient resources and infrastructure needed to run E-learning solution, so that E-learning Software has the versions of base applications that are cloud oriented.

There are some advantages of cloud based E-learning solutions [13]:

1) Lower Costs: you don't required high-powered and high priced computer system to run cloud based web applications because applications run on cloud not on desktop PC.
2) Improved Performance: There are fewer programs are loaded into device memory so that cloud based E-learning system boot and run faster.
3) Instant software updates: As the application is web based update occurs automatically.
4) Data reliability increased: Even if desktop computer crashes the data still remain accessible as it remains on cloud.
5) Device independence: As applications run on cloud you can change computers or networks.
6) Improved Improbability: Unauthorized person can't access any data by finding out digital assets [10].

TABLE II
COMPARATIVE STUDY BETWEEN PUBLIC, PRIVATE AND HYBRID CLOUD

| Public cloud | Private cloud | Hybrid cloud |
|---|---|---|
| Availability of Elastic and Flexible Environment | Scope of Security and Confidentiality | Offer flexibility, control and security |
| Pay for Use Service | Greater Customization: | Data centre consolidation |
| Freedom of self service | Maximum Protection | Risk transfer of workload |
| Resource Availability and Reliability | Own Dedicated Resources | Optimum Utilizat-ion of resources |
| Amazon EC2, Google App Engine, IBM Blue Cloud and Widows Azure | Amazon Virtual Private cloud, Eucalyptus Cloud Platform, IBM Smart Cloud, Microsoft Private Cloud | Requirement of both on-premises resources and remote server-based cloud infrastructure |

There are some disadvantages of cloud computing:

1) Network: You required stable internet connections, if cloud connection get terminated during session user may lose unsaved data, time [14].
2) Security: As all data and application stored on a system where they do not have full control, so that many organization feel unsecure [15].
3) Portability: Due to limitation of proprietary interfaces you can't bring system back in house or you can't choose another cloud provider [15].

## IV. INFRASTRUCTURE-AS-A-SERVICE CLOUD SOLUTION:

Matheus Cunha[16] investigated Current user of Infrastructure-as-a-service cloud faces difficulties in estimating cloud resources according to their application needs [16]. Cloud computing offers business model containing provision of on-demand, pay-per-use resources (e.g., computing, storage, applications and platforms), in the form of internet services [17], [18]. There are several cloud computing solutions exist, ranging from open source platforms which enables creation of private clouds inside organization [19], [20], to commercial cloud providers such as Microsoft's Windows Azure [21], Amazon's EC2 [22], Google's AppEngine [23], Salesforce [24] and Rackspace [25]. EC2 and Rackspace, these are examples of infrastructure-as-a-service (IaaS) clouds [17], these cloud providers offers virtual servers i.e. virtual machines with specific capacity for CPU, memory and storage, and it also offers virtual storage which can be remotely created, accessed and managed as services through public applications programming interfaces (APIs). In this way customers of these cloud providers can easily acquiring there required computing resources without having burden for managing physical infrastructure. I-a-a-s cloud providers bring a new challenge for cloud customers i.e. to select the best cloud resources according to the needs and characteristics of applications [16], for example EC2 cloud providers' offers more than 10 virtual machines or instances types with varied levels of computational capacity and prices [22]. Therefore, developers need to have a deep understanding of the requirements of their applications as well as of the expected performance of the different cloud resources and services that each provider offers [16].

CloudStone project [16] performs the Experimental results on Amazon EC2 which providing Infrastructure as a service which contains olio application in rubies and rails platform. Olio Application contains Web Server, Application Server and Database and Fagan which is session-based workload generator used for testing of application. It takes number of experimental test on Single as well as multiple server configuration and impact on different cloud EC2 instances for variety of workload on cost-effective manner.

Hobin Yoon[6] performs experimental analysis on Simple Queue Services(SQS) and Simple Storage Service provided by Amazon web Services for Infrastructure as Service. It determine device Rate Control for obtain suitable latencies According to latency Variation for SQS and elimination of bottlenecks with increasing parallelism for S3.Massage latencies of rate Controlled mechanism It is analyze that

1) Best performance of SQS shown with limit of 10 massages in Queue. It serves Services to client which sending massage to it one by one.

2) Request will not make by receiver if there is no massage in server that avoid unnecessary polling of massages.

3) Oldest massage Saturated in delete queue which is deleted by delete

4) Sender sends the message if It is not older than 15 seconds it prevents duplicate massages if it is not deleted timely fashion.

Amazon provides secure, scalable and reliable service storage S3 which is used in big data application where large data file transfer from external event source to S3.It signifies that end user must select appropriate data transfer services which they need.S3 having transfer manager component which is mainly divided into dynamic thread creation and increasing connection count limit which is in between 50 to 200.It shows by minimal modification in transfer manager and client environment it achieves 6 times performance increment.

TABLE III
PERFORMANCE RESULT OF AMAZON EC2 INSTANSES

| EC2 Instance | No. of Simultaneous Users |
|---|---|
| m1.micro | 15(Single Server) |
| m1.small | 25(Single Server) |
| c1.medium | 150(Single Server) |
| m1.large | 125(Single Server) |
| m2.xlarge | 150(Single Server) |
| c1.xlarge | 300(Single Server) |
| m1.xlarge | 200(Single Server) |
| m2.4xlarge | 300(Single Server) |
| c1.medium (x2) | 300(Multiple server) |
| c1.medium (x3) | 600(Multiple Server) |

While Amazon Simple Storage Services (S3) providing platform for reliable accessing data with fault tolerance and highly scalable manner, Richard K. Lomotey and Ralph Deters [5] presents problem on high communication latency that makes it uninteresting for mobile consumption of enterprise data in a highly distributed environment which presents MiLAMob which is middleware-centric framework simplifies real time authentication process. Proposed OAuth 2.0 technique such as Facebook, Google+ authenticated from security tokens with Amazon S3 Repository, by this approach mobile consumer can efficiently access enterprise data with less processing efforts. End users login through than username and password pair using any social network such as facebook, yahoo, and google+. If user is valid social account holder middleware fetches user credential and stores into repository by which company keep records of customers which have been contacted. By this MiLAMob completely deprecated existence of Amazon S3. MiLAMob with Amazon S3 can be used as better Framework for other IaaS based public cloud services such as Dropbox for file sharing. Because e-business portal there is rapidly changing data on server and now days, Most of the portals are switching to Apps in android platform

## V. Conclusion

In this study, We discuss MVC framework which provides more efficiency, maintainability, reusability and separate functional layers hence most of the industries uses that for system development and implementation. By considering high growth of e-learning domain we conclude that better e-learning enterprise system can be developed by integrating Struts 2.0, Spring 2.0 and Hibernate. but It realize that if application is not so large we can managed by Spring3.0 and Hibernate and reduce the extra burden of Struts framework because it is heavy weight application.

E-learning system provides SaaS to key factors in education domain and need to use Infrastructure as Service from cloud service provider .By above sections, We conclude that combination of EC2(Elastic cloud) and S3(simple secure storage) is more suitable for e-learning application. In sense that, Application deployed on EC2 medium instance and Database is on S3 repository because database always changing in e-learning application especially for education domain and extra security can be maintains by OAuth 2.0 technique.

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