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**Cloud Microservices And Applications**

**Research Paper**

**On**

**NMIMS Library Using Cloud Computing**

**By: Aryan Yadav**

**Siddharth Pandya**

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**Abstract:** The paper focuses on data related to Library Management System using cloud computing. Cloud computing gives an advantage for libraries, it is providing several opportunities to link their services to the cloud. Cloud computing is the new type of service providing on the Internet, which has entirely changed the way computers are used regardless of geographical barriers. The Problem being faced is the lack of information in site, surfing through various sites for books related to particular subject, Books not being available in college or book centre, high prices of the books, etc. So the solution to this is to make a user friendly and university related online library management system where all schools of NMIMS is covered (STME,SOL,SOC, SOHM) using cloud to share the storage space and computing power on the network then allocate and use it according to the users demands to prevent the waste of resources but to get fully utilized. The data generated from library is also growing rapidly, so that universities need a management system which can manage a large-scale data to manage its data library. Now many people are going to use cloud computing as it is bound to lead to the change of library management system structure, there will be more and more university libraries try to use cloud computing to improve library network. The thought is too help the students of NMIMS so that they can find all books at one place and also help other college students. This study may be useful in recognizing and producing cloud based services for libraries.

**Keywords:** Cloud Computing, Software as a Service, Platform as a Service, Infrastructure as a Service, Models of Cloud Computing, Applications of cloud Computing, University, Library Management System.

**Background of the Study**

A library is an organised collection of information sources which is made accessible to the people. The library usually contains the information physically or in a digitized format. In the olden period the access was usually in the library room as the technology grew up the access that was made online.Library is a fast growing organism. The ancient methods to maintain it are no longer dynamic and efficient. For expeditious retrieval and dissemination of information and better service for the clientele, application of modern techniques has become absolutely indispensable. And yet we follow such methods, so to improve and save time of the many we came up with this idea

**Literature Review**

**Introduction:**

The library management system software helps in reducing operational costs. Managing a library manually is labor intensive and an immense amount of paperwork is involved. An automated system reduces the need for manpower and stationery. This leads to lower operational costs.

Cloud computing is the use of the Internet to provide related services, which has three modes including increasing. Delivery and utilization, usually involving in scalable and often virtualized resources. In the computer science field, cloud is always a metaphor as network, the Internet. Cloud computing can be divided into narrow and broad cloud computing The narrow cloud computing refers to the delivery of network infrastructure and usage patterns in order to expand demand and easy way to get the necessary resources, generalized cloud computing refers to the delivery and utilization mode of relevant service, which can be related to the Internet, software and others. Other services may also be demand and easy way to get the desired extended resources. In this case, it can circulate the computing power as a commodity on the Internet through the cloud computing. The main characteristic of cloud computing is to switch the computer resources to the desired application, then access to computer and storage systems according to the users' demands, which will make the computer located in a large number of distributed computers. Cloud computing development process has four main stages, including power mode, utility model, grid computing and cloud computing In the view of this development, the cloud computing has developed after several changes before reaching a more mature today levels.

**PROJECT AIMS AND OBJECTIVES:**

The project aims and objectives that we are trying and will be achieved are:

1. You will be able to access all the books from anywhere.
2. All books related to the school of NMIMS and particular to the subject will be available.
3. Online notice board about the workshop.
4. About the On Campus Library of our College

**BACKGROUND OF PROJECT:**

Library Management System is an application which refers to library systems which are generally small or medium in size. It is used by librarian to manage the library using a computerized system where he/she can record various transactions like addition of new books, addition of new students etc. We got the idea of the project seeing we and many people face the same problem with the library so to make it easier and more user friendly with the students we came up this idea.

**Problems of existing system**

1) Bad Design of site.

2) Hard to navigate.

3) Waiting time to get any book in college library.

4) Book not being Available

5) Book not being there.

**OPERATION ENVIRONMENT**

**Hardware tools required:**

PROCESSOR: INTEL CORE PROCESSOR OR BETTER PERFORMANCE

OPERATING SYSTEM: ALL WINDOWS, MAC, UBUNTU, etc

MEMORY : 1GB RAM OR MORE HARD DISK SPACE MINIMUM 3 GB FOR DATABASE USAGE FOR FUTURE.

**Software tools used:**

The whole Project is divided in two parts the front end and the back end.

FRONT END: The front end is designed using of HTML, PHP, CSS, Java script

1. HTML- HTML or Hyper Text Mark-up Language is the main mark-up language for creating web pages and other information that can be displayed in a web browser.HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like <html>), within the web page content. The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as JavaScript which affect the behaviour of HTML web pages.

2. CSS- Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a mark-up language. While most often used to style web pages and interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. CSS is a cornerstone specification of the web and almost all web pages use CSS style sheets to describe their presentation.CSS is designed primarily to enable the separation of document content from document presentation, including elements such as the layout, colours, and fonts.

This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting, and reduce complexity and repetition in the structural content (such as by allowing for table less web design).CSS can also allow the same mark-up page to be presented in different styles for different rendering methods, such as on-screen, in print, by voice (when read out by a speech-based browser or screen reader) and on Braille-based, tactile devices. It can also be used to allow the web page to display differently depending on the screen size or device on which it is being viewed

3) PHP- PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP is now installed on more than 244 million websites and 2.1 million web servers.

Originally created by Rasmus Lerdorf in 1995, the reference implementation of PHP is now produced by The PHP Group. While PHP originally stood for Personal Home Page, it now stands for PHP: Hypertext Pre-processor, a recursive backronym. PHP code is interpreted by a web server with a PHP processor module, which generates the resulting web page: PHP commands can be embedded directly into an HTML source document rather than calling an external file to process data. It has also evolved to include a command-line interface capability and can be used in standalone graphical applications. PHP is free software released under the PHP License. PHP can be deployed on most web servers and also as a standalone shell on almost every operating system and platform, free of charge.

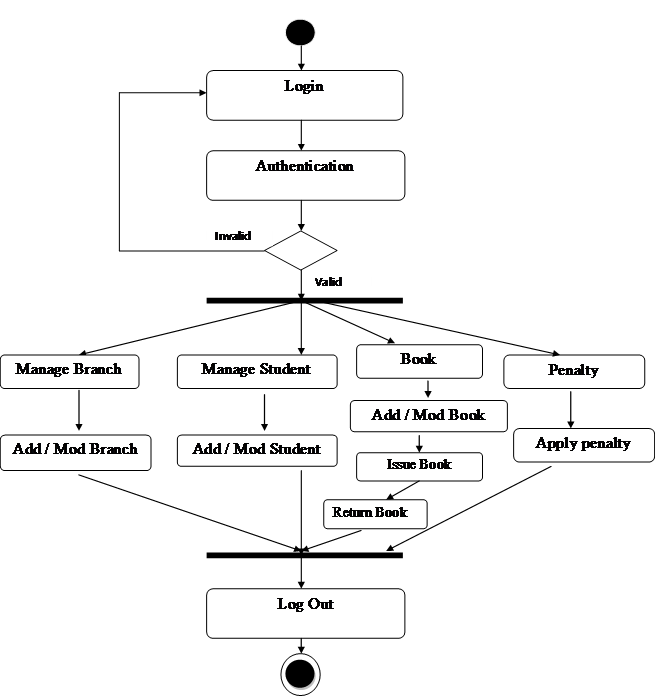
BACK END- The back end is designed using MySQL which is used to design the databases

1. MYSQL- MySQL ("My S-Q-L", officially, but also called "My Sequel") is (as of July 2013) the world's second most widely used open-source relational database management system (RDBMS). It is named after co-founder Michael Widenius daughter, My. The SQL phrase stands for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for- profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation .MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks). LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python." Free-software-open source projects that require a full-featured database management system often use MySQL. For commercial use, several paid editions are available, and offer additional functionality.

Applications which use MySQL databases include: TYPO3, MODx, Joomla,

WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Wikipedia, Google (though not for searches), Facebook, Twitter, Flickr, and YouTube.

**Data Flow Diagram**



**APPLICATIONS OF CLOUD COMPUTING IN LIBRARY MANAGEMENT SYSTEM:**

1. **Library Automation System Automation is a field:** most of the libraries are keen on day-to-day operations. Previously, automation in libraries is being carried out on a locally hosted server using a variety of commercial and open source integrated library management software and directed by internal IT professionals or library staff. Although, several software vendors and third-party services are now providing to host this service on the cloud to save libraries from spending on hardware. Apart from cost-benefit, libraries will be free from maintenance of undertakings like software maintenance, backup etc. For example vendors like Ex-Libris, OSS Labs.
2. **Framework of Repositories and Digital Library**: In this age of digital era each library needs a digital library to efficiently access their information, services and resources to certain network access. Therefore, each library has a digital library that is build up using any cloud based digital library software. DuraSpace has two software’s called Dspace and Fedora Commons, but Dspace is widely used to frame repositories and digital libraries associated with Fedora Commons. Dura Cloud supplies the entire solution for developing a repositories and digital library with standard interfaces and open source code for both software.
3. **Website Hosting** : With the help of cloud technologies many libraries can host their own websites. Website hosting is one of the initial embracing of cloud computers because several organizations, including libraries prefer to host websites with third-party service providers rather than hosting and maintaining their own servers. An example of a service is hosting websites outside the Google Site Library servers and multiple editors allow access to the site in various places. The District of Columbia Public Library is using Amazon's EC2 service to host its website and offers libraries with faster extensible and idleness.
4. **Storage:** Libraries need space to store similar electronic files and documents like official correspondence, full-text documents, bibliographic records, teachings, etc. Currently, these are stored and retrieved through a personalized desktop or locally hosted server. Cloud computing is compensating for new services, which provide free space for storing files and documents.
5. **Browsing Library Data:** Several libraries already have online catalogs and allocate bibliographical data with Online Computer Library Center (OCLC). It is a great example of using cloud computing to contribute library data together over the years. WorldShare Management Services (WMS) an incorporated group of cloud based library management applications of OCLC provides libraries cost savings, workflow functionality, and capability to distribute new trends to patrons by allocating data, and work around the libraries.

**MODELS OF CLOUD COMPUTING:**

**Deployment Models:** NIST defines cloud deployment model is according to where the infrastructure for the deployment resides and who has control over that infrastructure. NIST classified four types of deployment model ie Private Cloud, Community Cloud, Public Cloud, Hybrid Cloud and as per our project we will be using the given below model:

**a) Private Cloud:** Private cloud is usually infra and services to be accessible within an organization. Such services may be managed by the organization itself to support various user groups, or third party. This cloud offers more security as it is implemented within the internal firewall

**Benefits:** The five main benefits organizations can attain by running their IT systems in a private cloud server environment are :

1. Improved resource utilization
2. Reduced costs
3. Increased security
4. Regulatory compliance
5. More flexibility.

**Features:**

**The five characteristics of a private cloud:**

1. Scalable: High levels of utilization

2. Accessible: IT customers can self-provision

3. Elastic: Appearance of infinite capacity on demand

4. Shared: Workloads are multiplexed, capacity is pooled

5. Metered consumption: Ability to pay for use with no commitment.

**Service Models:** A cloud service is any service provided to users on request via net from a cloud computing provider's servers as resisted to being supplied within own premises servers of organization. Service models are categorized in four types ie Software as a Service (SAAS),Platform as a Service (PAAS) & Infrastructure as a service (IAAS) and as per our project we will be using the given below model:

**b) Platform as a Service (PaaS):**

Platform as a Service (PaaS) provides a runtime environment. It allows programmers to easily create, test, run, and deploy web applications. You can purchase these applications from a cloud service provider on a pay-as-per use basis and access them using the Internet connection. In PaaS, back end scalability is managed by the cloud service provider, so end- users do not need to worry about managing the infrastructure. PaaS includes infrastructure (servers, storage, and networking) and platform (middleware, development tools, database management systems, business intelligence, and more) to support the web application life cycle.

Platform as a Service model assists to create computing platforms for running software and other tools on a computer without having to manage the software and hardware at the end of the user. PaaS offers virtual machines, applications operating systems, development frame works, services, transactions and control structures. The client can organize its applications on the cloud infra or use applications programmed using languages and tools sustained by the PaaS service provider. PaaS model is providing platforms to customers for maintain and support their IT infrastructure without using a large amount of money to buy hardware, software and related technologies.

Example: Google App Engine, Force.com, Joyent, Azure.

**Characteristics of PaaS:** 1) All in one

2) Web access to the development platform

3) Offline access

4) Built-in scalability

5) Collaborative platform

6) Diverse client tools

**Benefits of PaaS:** 1) Quick development and deployment

2) Reduces TCO

3) Supports agile software development

4) Different teams can work together

5) Ease of use

6) Less maintenance overhead

7) Produces scalable applications

**Drawbacks of PaaS:** 1) Vendor lock-in

2) Security issues

3) Less flexibility

4) Depends on Internet connection

**Monolithic architecture:**

Monolithic applications are designed to handle multiple related tasks. They’re typically complex applications that encompass several tightly coupled functions.

For example, consider a monolithic ecommerce SaaS application. It might contain a web server, a load balancer, a catalog service that services up product images, an ordering system, a payment function, and a shipping component.

As you can imagine, given their broad scope, monolithic tools tend to have huge code bases. Making a small change in a single function can require compiling and testing the entire platform, which goes against the agile approach today’s developers favor.

**Benefits:**

Monolithic is server-side system based on single application and it is easy to develop, deploy and manage.

**Challenges:**

* Highly Dependent
* Language/Framework
* Growth
* Hero Deployment
* Scaling

**ADVANTAGE OF THE LIBRARY MANAGEMENT SYSTEM**:

1. It reduces the manual paperwork through it and gives proper information of books has been recorded automatically.

2. Librarian can update the information of books and arriver record of the books.

3. It saves human efforts and time.

4. With the help of library management software, the customer can easily search and find the books.

5. It increases the efficiency

6. It is user-friendly.

**FUTURE WORK:**

The Future work or scope of our library can be:

1. Adding more books in future so that students can refer more.
2. A feature of group chat where students can discuss various issues of engineering can be added to this project thus making it more interactive more user friendly.

**CONCLUSION:**

To conclude this study helps us provides the inferences and concepts of cloud based applications in libraries to improve their services in a more competent way. The website provides a computerized version of library management system which will benefit the students of NMIMS and other collages student. It makes entire process online where student can search for their books at one site from any place. It also give necessary suggestion to library and also add info about workshops or events happening in our college or nearby college in the online notice board.

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