

Cloud Approach for Educational Sector Using AWS

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Abstract— Education holds a pivotal position in the development of any country. It stands as the primary catalyst for fostering a robust nation in terms of socio-economic advancement. However, the education sector has encountered numerous challenges in delivering education to students during the pandemic, particularly amid lockdown periods caused by the Covid-19 outbreak. This abstract introduces a cloud-based Learning Management System (LMS), a digital platform designed to enhance education by leveraging cloud computing technology. The system enables seamless creation, delivery, and management of educational content and resources online. By harnessing the power of the cloud, this LMS offers scalability, accessibility, and collaborative features, facilitating efficient learning experiences for students, educators, and administrators alike. It highlights the benefits of such a system and its potential to transform traditional education into a dynamic and adaptable online learning environment. This particular technology aids higher education students in e-learning, job applications, and accessing online courses from diverse platforms. The findings demonstrate an efficient application of cloud technology in the education sector.

Index Terms— Cloud Computing, Amazon Web Services, E-learning, Paas, Saas, Iaas.

I. INTRODUCTION

Cloud computing stands as a transformative paradigm that has reshaped the landscape of data and application access, storage, and management for individuals, businesses, and institutions. It signifies a pivotal departure from conventional on-site computing models towards a more adaptable, scalable, and cost-efficient approach to IT infrastructure and services. Essentially, cloud computing involves furnishing resources—like database, services and storage—via the internet (commonly termed the "cloud"). Rather than relying on local servers or personal devices for running applications or storing data, users leverage a vast shared pool of resources housed in data centers managed by cloud service providers. One of the prominent players in this domain is Amazon Web Services (AWS), a leading cloud computing platform. Established in 2006, AWS has evolved into one of the most comprehensive and widely embraced cloud service providers globally, offering an extensive range of cloud-based infrastructure, platform, and software services. AWS empowers individuals, startups, enterprises, and governmental bodies to access scalable and cost-efficient computing resources via the internet, revolutionizing the way businesses function and innovate. Notably, Amazon Web Services (AWS) serves as a robust and adaptable cloud computing platform that significantly influences the realm of e-learning. With the burgeoning demand for online education, AWS offers the optimal infrastructure and services necessary for crafting, delivering, and managing e-learning platforms and resources.

II. LITERATURE REVIEW

In recent years, there has been considerable scholarly focus

on the widespread adoption and utilization of cloud computing, encompassing various aspects. Numerous theoretical and empirical investigations have been conducted across diverse settings and disciplines. Chen and Chen [8], for example, found the reason affecting Taiwan's implementation and the usage of cloud computing. The Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB), and the Diffusions Innovation Theory (DIT) were combined in their study. 1,069 people from various industries and backgrounds participated in the study, which used (SEM) to analyze the data. They showed that behavioural intention is considerably and favourably impacted by perceived compatibility, simplicity of use, perceived utility, and attitude.

Al-Sharafi and Arshah (citation [9]) aimed to outline the fundamental elements influencing the integration of cloud computing services in organizational settings through a comprehensive analysis of prior literature. Their findings highlighted several crucial factors such as comparative advantages, intricacy, perceived security and confidentiality, compatibility, executive endorsement, cost minimization, competitive influences, IT preparedness, company size, vendor support, governmental regulations, regulatory structures, trial feasibility, perceived dependability, accessibility, unpredictability, and credibility, all of which significantly impact the enduring adoption of cloud computing technologies in global enterprises.

In contrast, Kandil and colleagues (reference [10]) investigated the elements that impact the adoption of cloud computing specifically in Egypt. Their study involved a survey of 432 organizations spanning various industries and utilized SEM for data analysis.. Their research underscored that factors including comparative benefits, alignment with

existing systems, intricacy, security measures, executive support, technological preparedness, internet accessibility, stability and efficiency, telecommunications framework, collaboration with business partners, and external influences from trade partners greatly influence the uptake of cloud computing.

Furthermore, Stieninger et al. [11] investigated the determinants impacting various aspects of cloud computing systems. The study involved 203 participants from diverse global regions. Analysis of the data was conducted using variance-based structural equation modeling (VSEM). The findings revealed that elements like trust, security and complexity greatly shape individuals' attitudes regarding the adoption of cloud computing. Nevertheless, these factors did not directly correlate with the actual utilization of cloud systems.

Additionally, Tripathi [12] scrutinized the elements affecting the acceptance and utilization of cloud computing in India. The study comprised 458 participants from both adopting and non-adopting firms. Employing SEM for data analysis, the findings indicated that perceived benefits played a more significant role in impacting organizations that adopted cloud computing, compared to the influence of negative factors. Conversely, negative aspects such as perceived risk and high costs were observed to have a relatively greater impact on non-adopting companies.

In the view of small scale and medium scale businesses (SMEs), Hassan et al. [13] looked at the elements influencing Malaysian SMEs' use of cloud computing. 132 senior managers from these SMEs participated in the research. Using the PLS approach, the research showed that the implementation of cloud computing was greatly impacted by both outside forces and the availability of IT resources.

Likewise, Senarathna et al. [14] investigated the primary elements affecting the use of cloud computing among Australian SMEs. Their study encompassed a sample of 149 SMEs from Australia. Employing the multiple regression method to analyze the gathered data, the findings indicated that SMEs were more influenced by factors associated with enhancing their organizational capabilities, such as relative advantage and awareness, rather than factors linked to risks, such as security, privacy, and flexibility.

III. INTEGRATION MODEL

Creating a standard e-learning system involves implementing an LMS, integrating Internet services across college institutions and business systems. The amalgamation of these system elements occurs through several layered approaches::

1. Faculties, Children and other involved individuals in the learning process have the capability to use the system and interact irrespective of their place.
2. Information integration involves the system's capacity to collect diverse, unstructured data, while also allowing users to access structured data.

3. Process integration encompasses the incorporation of adaptive e-learning processes facilitated through web services.
4. Application integration occurs at the application level utilizing cloud computing infrastructure

Figure 1. illustrates the process if integrating cloud computing infrastructure with e-learning services



Figure 1. E-learning services with cloud computing

IV. PROPOSED METHODOLOGY

A. Architecture Diagram

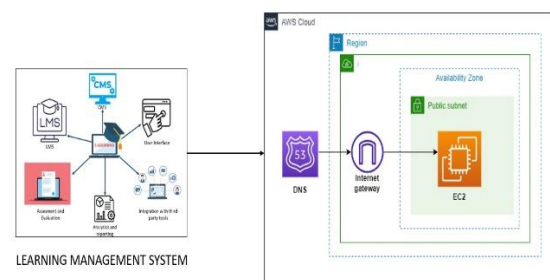


Figure 2. Architecture Diagram

B. Design Methodology:

a) Amazon EC2 Instance Provisioning

Identified the specific components needed for LMS (web servers, application servers, databases).

Determined the appropriate instance types based on workload requirements, such as CPU, memory, and storage needs.

We launched Amazon EC2 instances for each component, ensuring they are properly sized and configured.

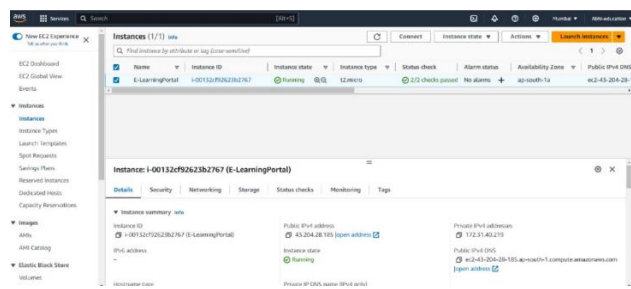


Figure 3. Amazon Instance Creation

b) Virtual Private Cloud (VPN) Setup

Designed a VPC architecture that isolates and segments our LMS components.

Defined subnets for public-facing components like web servers and private subnets for databases.

Established Network Access Control Lists (NACLs) and security groups for managing inbound and outbound traffic.

Implemented VPN or Direct Connect if you need secure access to our VPC from on-premises

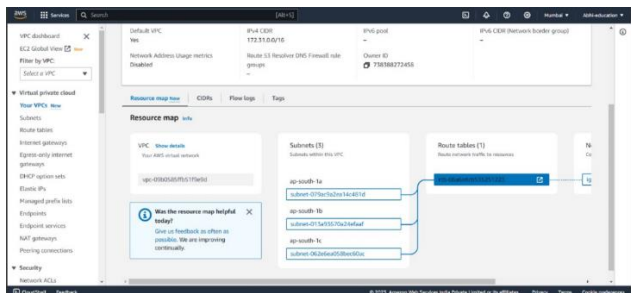


Figure 4. VPN setup

c) Domain Registration and DNS Configuration

First, we have registered a domain through a domain registrar like Amazon Route 53 or a third-party service.

Configure DNS records in Route 53 to associate your domain with the public IP addresses of your EC2 instances.

Set up DNS records like A records, CNAMEs, and MX records as needed for your LMS.

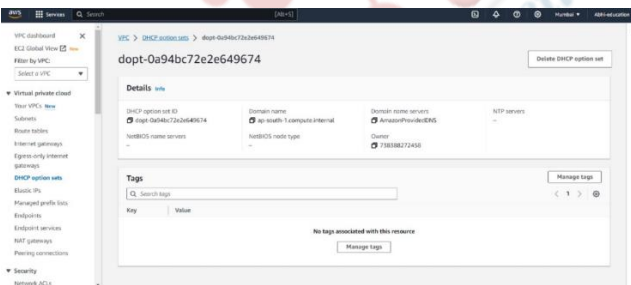


Figure 5. DNS Configuration

d) Web page Deployment and Testing

Deployed our LMS web pages and application code onto the appropriate EC2 instances.

Ensure that your web servers are properly configured to serve the web content. Test the LMS by accessing it via the registered domain name to verify that web pages load correctly and the application functions as expected

V. RESULT ANALYSIS

A. User Dashboard

A user dashboard in a Learning Management System (LMS) is a central hub where learners can access and manage various aspects of their educational journey. It serves as a personalized interface, providing learners with valuable information, resources, and tools to enhance their learning experience..

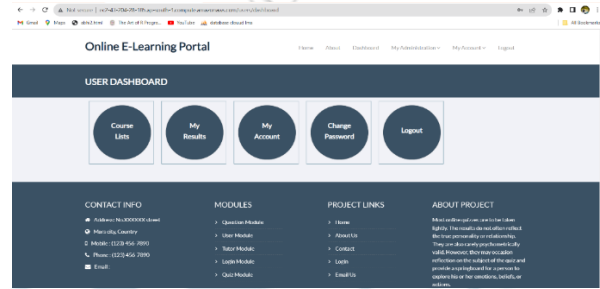


Figure 6. User Dashboard

B. Course Details

In a Learning Management System (LMS), course details provide essential information about a specific course offered within the platform. These details are typically presented to learners and instructors to help them understand what the course covers, its objectives, prerequisites, and other important information.

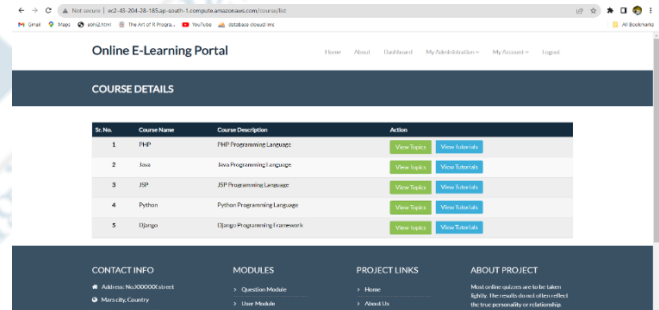


Figure 7. Course Lists

C. Academic Performance and Results

Academic performance tracking in a Learning Management System (LMS) is a critical feature that enables both instructors and learners to monitor progress, assess achievements, and make informed decisions about the learning process.

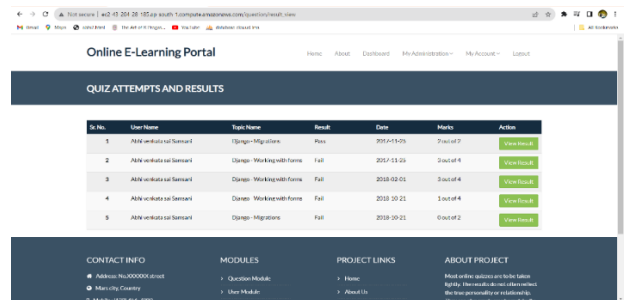


Figure 8. Academic Progress

VI. ADVANTAGES

1. **Cost-effectiveness:** Cloud computing allows educational institutions to reduce costs associated with hardware procurement, maintenance, and upgrades. Instead of investing in expensive on-premises infrastructure, schools and universities can use cloud services on a pay-as-you-go basis, minimizing upfront capital expenditure.
2. **Scalability:** This scalability is particularly beneficial during peak periods such as enrollment periods or exam seasons, ensuring that students and faculty have access to the resources they need without experiencing performance issues.
3. **Enhanced security and data protection:** Cloud service providers typically offer robust security measures and data protection mechanisms to safeguard sensitive educational data.
4. **Resource sharing and distribution:** Cloud computing enables educational institutions to store, manage, and distribute educational resources such as lecture notes, assignments, and multimedia content more efficiently.
5. **Accessibility:** Cloud-based services can be accessed from any device with an internet connection, enabling students and educators to access educational resources and collaborate remotely from anywhere in the world. This accessibility fosters flexibility in learning and teaching, accommodating diverse learning styles and preferences.

VII. CONCLUSION

In this paper, the advent of a cloud-based Learning Management System (LMS) marks a significant milestone in the evolution of education. By embracing the capabilities of cloud computing, this innovative platform empowers educational institutions to deliver content, engage learners, and manage resources with unprecedented flexibility and efficiency. The scalability of the cloud ensures that educational offerings can grow to meet the demands of a global audience, while its accessibility democratizes learning, enabling students from diverse backgrounds to access high-quality education. Moreover, the collaborative features of this LMS foster interactive and engaging learning experiences that bridge the gap between students, educators, and administrators. In essence, the cloud-based LMS holds the potential to revolutionize traditional education, ushering in an era of dynamic, adaptable, and inclusive online learning environments that benefit learners and institutions alike.

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