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Design and Development of System for detection of security Breach in Cloud Environment

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Abstract: ***Cloud Computing has brought an incredible change in operations of the IT industries. The cloud computing has benefited the IT industries with less infrastructure investment and maintenance. As cloud provides services like Infrastructure-as-service (IaaS), Platform-as-Service (PaaS) and Software-as-service (SaaS) to its clients, it is essential that it also ensures data security to its clients. Security is an essential service to be provided exclusively in public cloud and hybrid cloud environment where in the data can be easily hacked or tampered. Nowadays, digital storage of computer data is moving toward cloud computing which is a set of infrastructure provides data storage for organizations and individuals. Due to this large scale, in case an attack occurs in the network of a cloud it would be a big challenge to investigate the cloud. This paper aims to implement the development of system for detection of security breach in cloud environment by introducing the non-repudiation in MVC Music Library application.***

Keywords: Cloud Computing, Security, Digital Forensic, Virtualization, Non-repudiation

I. INTRODUCTION

Cloud computing which is also known as 'Internet computing' generally is seen as collection of clouds on the web. It provides technology enabled services to the people and organizations by utilizing the internet. People can just access to the web anywhere and at any time without to think about the physical management as well as the maintenance issues. Most of the cloud computing resources are very dynamic and scalable because they are independent computing which is free from maintenance cost. The most widely used definition of cloud computing is made by NIST where they define Cloud Computing as a pool of computing resources such as servers, networks, services and applications that provide convenience, flexibility and more performance on demand network access which is consisting of five essential characteristics, three service models and four deployment models. These five essential characteristics of cloud computing are on-demand selfservice, broad network access, rapid elasticity, resource pooling and measured service [6].

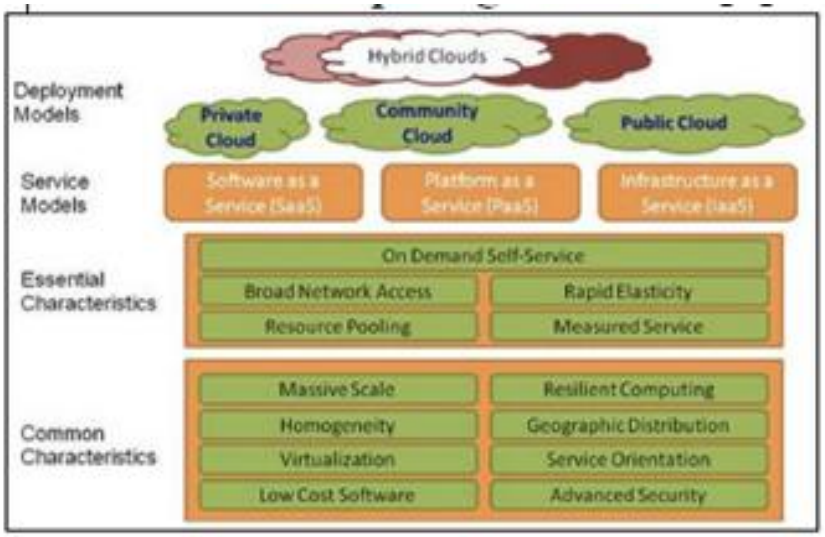


Fig. 1: The NIST Cloud Definition Framework

Cloud computing composed of three service models that are Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS) and Cloud Infrastructure as a Service (IaaS). SaaS is where the application is hosted and delivered online through a web browser; PaaS is where the cloud provides the software platform for systems while IaaS is a set of virtualized computing resources. The four cloud deployment models are the Public Clouds, Community Clouds, Private Cloud and Hybrid Cloud. Fig.1 above is the overall picture of the cloud computing definition given by NIST. Based on the standard definition given by the NIST, cloud computing aim to make a better use of distributed resources and combine them to achieve higher throughput as well as to be able to solve large scale computation problems [6].

Digital forensics is the process of preserving, collecting, confirming, identifying, analyzing, recording, and presenting crime scene information. Wolfe defines digital forensics as “A methodical series of techniques and procedures for gathering evidence, from computing equipment and various storage devices and digital media that can be presented in a court of law in a coherent and meaningful format". According to a definition by NIST, computer forensics is an applied science to identify an incident, collection, examination, and analysis of evidence data. While doing so, maintaining the integrity of the information and strict chain of custody for the data is mandatory. Several other researchers define computer forensics as the procedure of examining computer system to determine potential legal evidence [10].

Cloud forensics can be defined as applying computer forensics procedures in a cloud computing environment. As cloud computing is based on extensive network access, and as network forensics handles forensic investigation in private and public network, Ruan et al. defined cloud forensics as a subset of network forensics. They also identified three dimensions in cloud forensics – technical, organizational, and legal. Cloud forensics procedures will vary according to the service and deployment model of cloud computing. For Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS), we have very limited control over process or network monitoring. Whereas, we can gain more control in Infrastructure-as-a-Service (IaaS) and can deploy some forensic friendly logging mechanism. The first three steps of computer forensics, identification, collection, and organization of evidence will vary for different service and deployment model. For example, the evidence collection procedure of SaaS and IaaS will not be same. For SaaS, we solely depend on the CSP to get the application log, while in IaaS, we can acquire the virtual machine image from the customer and can enter into examination and analysis phase. On the other hand, in the private deployment model, we have physical access to the digital evidence, but we merely can get physical access to public deployment model [10].

II. Proposed Methodology

Security is the important aspect in Cloud computing. Various attacks such as DoS, DDoS, sniffer attack, spoofing, phishing, Non-repudiation and so on are there in network. To detect non-repudiation attack in cloud environment, we proposed

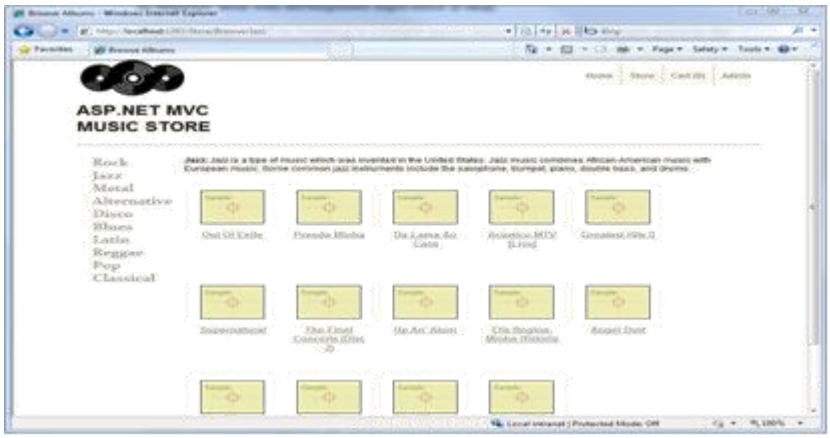
the simple system such as music library for detecting the security breach in cloud environment by capturing the conventional and forensic data.

The application of music library is developed by using the .net platform is hosted in the cloud environment and the non-repudiation is detected by capturing the forensic data such as longitudinal and latitudinal information even the conventional information.

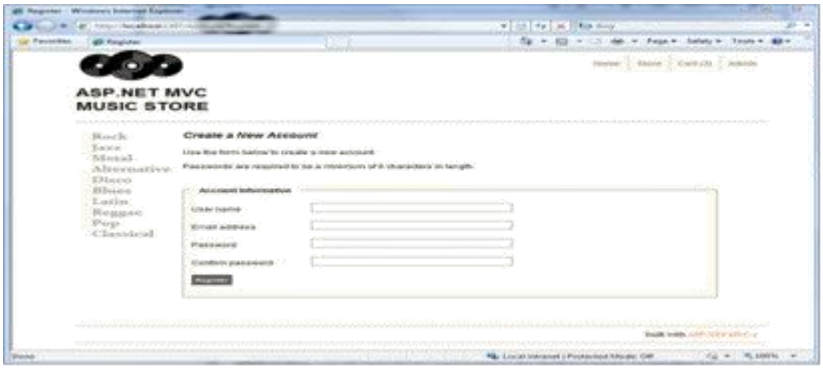
III. Implementation of Proposed Methodology

The application is a simple music store. There are three main parts to the application: shopping, checkout, and administration.

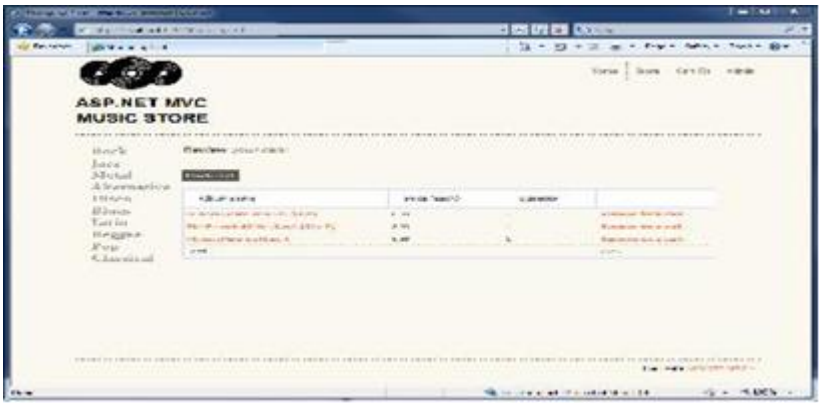
Visitors can browse Albums by Genre:



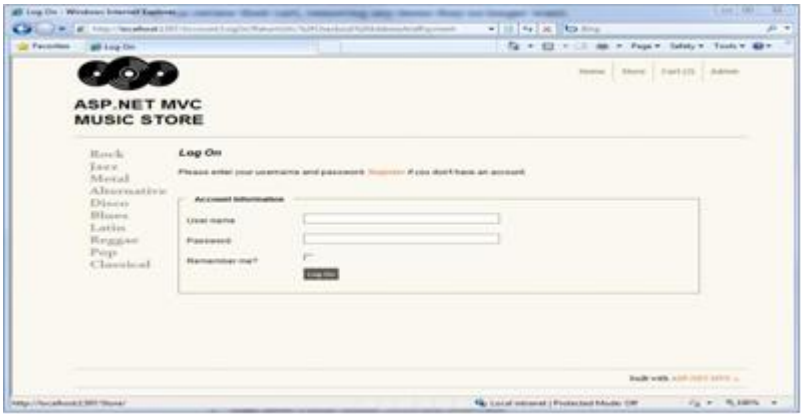
They can view a single album and add it to their cart:



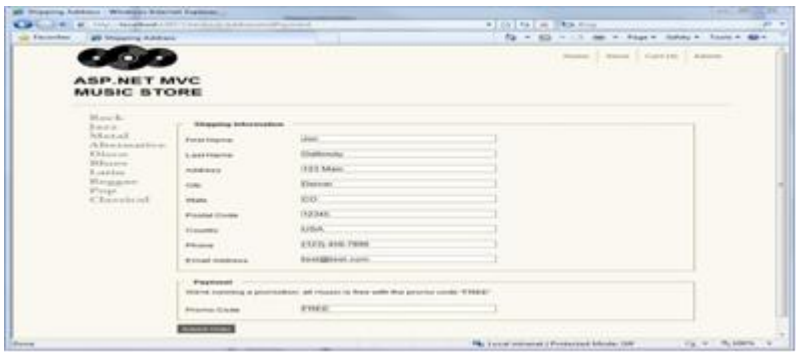
They can review their cart, removing any items they no longer want:



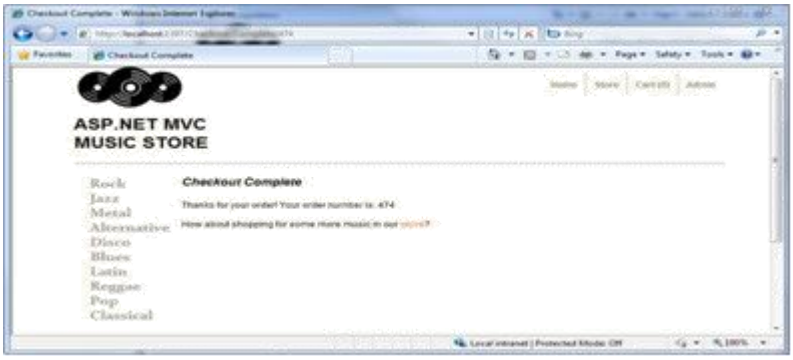
Proceeding to Checkout will prompt them to login or register for a user account.



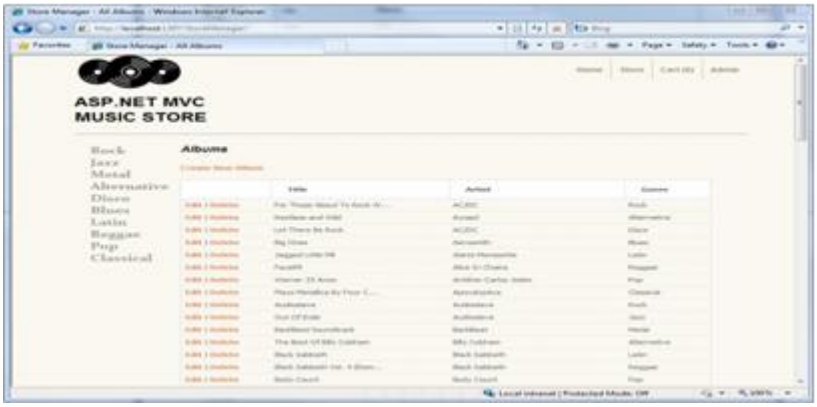
After creating an account, they can complete the order by filling out shipping and payment information.



After ordering, they see a simple confirmation screen:



The Administration page shows a list of albums from which Administrators can Create, Edit, and Delete albums:



IV. RESULT AND ANALYSIS

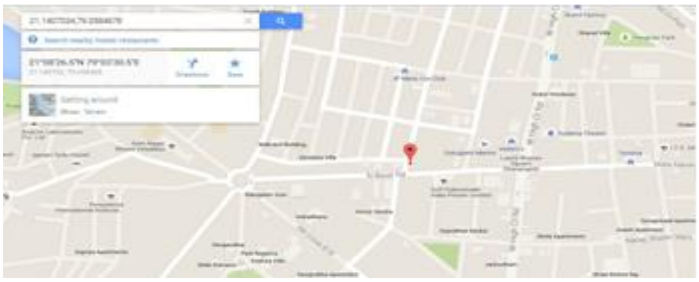
Cloud Computing has been considered as the future of IT that leads to novel computing models. However, security has been one of the major concerns that prevent commercial applications from being accepted widely. Here we are introducing non-repudiation in system and reporting that by capturing the LAN ip, machine name, user name, public ip, time and most probably the geographical location of the user.

Capture Admin home screen:

Capture transaction log of users as shown in below screen:

The data we are fetching and storing in database .It consist of current data as well as last transaction data which is stored in cookie shown in the given screen as follows:

Even we are showing the location on google map .The two locations on google map are as follows: Current location:



Last transaction location on Google map as follows:

V. Conclusion and Suggested Future Work

Cloud computing is a rapidly emerged technology and it is a widely accepted computing paradigm all around the world by its advantages on quick deployment, cost efficiency (on setting up and improvement), large storage space, and easy access to system anytime and anywhere. Apart from these advantages it has some disadvantages on security and privacy concerns, which are seen as the primary obstacles to wide adoption. At the same time, because of the distributed nature of the system, there is a risk of security attacks on services and resources in cloud computing. These attacks can be both outside and inside the cloud provider's network. We have studied one type of attack detection in cloud environment i.e. Non-repudiation. Designed the system of Music library and studied the Non-repudiation in cloud environment.

The future work is to study the experimental performance of various attacks such as phishing, spoofing,DoS, DDoS, man-in-the-middle, sniffer and its detection in cloud environment by capturing forensic and conventional data by developing the various application in cloud environment.

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