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Blockchain Based Video Surveillance System

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ABSTRACT: We propose a video surveillance system based on blockchain system. The proposed system consists of a blockchain network with trusted internal managers. The metadata of the video is recorded on the distributed ledger of the blockchain, thereby blocking the possibility of forgery of the data. The proposed architecture encrypts and stores the video, creates a license within the blockchain, and exports the video. Since the decryption key for the video is managed by the private DB of the blockchain, it is not leaked by the internal manager unauthorizedly. In addition, the internal administrator can manage and export videos safely by exporting the license generated in the blockchain to the DRM-applied video player.

KEYWORDS: Video Survillance, Blockchain, Databse.

I. INTRODUCTION

Video surveillance is a vital tool for protecting people and property around the clock. The increasing availability and, thus, lower cost of higher-quality cameras makes improving the effectiveness of video more affordable. However, a new issue now holds back users increased storage requirements. In a normal retail environment, it is common for video storage costs to exceed 50% of the entire surveillance system cost. There is also a problem of the Security provided to such videos stored which includes the leaks from the unauthorized users and the internal administrators.Video surveillance involves the act of observing a scene or scenes and looking for specific behaviors that are improper or that may indicate the emergence or existence of improper behavior, Common uses of video surveillance include observing the public at the entry to sports events, public transportation (train platforms, airports, etc.), and around the perimeter of secure facilities, especially those that are directly bounded by community spaces.The video surveillance process includes the identification of areas of concern and the identification of specific cameras or groups of cameras that may be able to view those areas. If it is possible to identify schedules when security trends have occurred or may be likely to occur, that is also helpful to the process. Then, by viewing the selected images at appropriate times, it is possible to determine if improper activity is occurring.A blockchain is a distributed ledger that is completely open to any and everyone on the network. Once an information is stored on a blockchain, it is extremely difficult to change or alter it. Each transaction on a blockchain is secured with a digital signature that proves its authenticity.

II. PROBLEM STATEMENT

The video surveillance system monitors video output from IP cameras and stores video information. It consists of a camera, a transmission device, a storage device, and a playback device. In recent decades, video surveillance systems have become increasingly large-scale to be managed with the rapid dissemination of CCTV (closed circuit television) for the purpose of crime prevention and facility management. The videos stored in the video surveillance system must be managed safely, but the videos are leaked out to unauthorized persons or viewed, resulting in the infringement of personal information. To solve this problem, a system has been developed that applies access control to video surveillance system, but there is still insufficient research to prevent unauthorized leakage by internal administrator

III. PROPOSED SYSTEM

The Proposed System consists of the Blockchain based Video surveillance and the usage of blockchain technology. Blockchain is a distributed database that stores data records that continue to grow, controlled by multiple entities. Blockchain (distributed ledger) is a trustworthy service system to a group of nodes or non-trusting parties, generally blockchain acts as a reliable and reliable third party to keep things together, mediate exchanges, and provide secure computing machines.

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IV. METHODOLOGY

This stage is the underlying stage in moving from issue to the course of action space. Accordingly, starting with what is obliged; diagram takes us to work towards how to full fill those requirements. System plot portrays all the critical data structure, record course of action, yield and genuine modules in the structure and their Specification is picked. This assumes an essential part on the grounds that as it will give the last yield on which it was being working. In our work we use following modules, these modules are listed below:

- **Users Profile Operations**
  Here, the end users can perform various operations on their profiles. Firstly, the users can register a new account and thus getting an access to the portal. And then the users can login to their accounts using the registered email ID and password to access various other divisions in the portal. The users can then choose to update their profile by providing the new values to the fields they have provided during the registration phase, or the user can wish to change their password by providing their old password and new password. The user can also opt to delete their accounts in case they wish to no longer access our portal. The user can also logout from the portal to make sure the session created for them during login is terminated.

- **Blockchain implementation**
  Here, we implement the core Distributed Ledger network (Blockchain Architecture). We also create an interface to the users where they can setup the blockchain node by entering its IP address. Users can add as many nodes as they want. More the nodes, better the security.

- **Surveillance Application**
  Here, we implement the application which communicates with CCTV/ Web Camera to capture the video frames. This can be set-up by the users by providing the IP address of the node where CCTV is pushing the video streams.

- **Blockchain Service Implementation**
  Here, we provide couple of services w.r.t blockchain. The first service is called 'Video Write' service which will be used by the surveillance application to write the videos to blockchain network. The second service is called 'Video Read' service which allows the authorized users to download the video frames from the blockchain network.

- **Surveillance data Access implementation**
  Here, we implement the Authorization mechanism to the Blockchain data. The authorized users can then read the video frames from Blockchain network using the previous module.

➢ SYSTEM ARCHITECTURE

The architectural configuration procedure is concerned with building up a fundamental basic system for a framework. It includes recognizing the real parts of the framework and interchanges between these segments. The beginning configuration procedure of recognizing these subsystems and building up a structure for subsystem control and correspondence is called construction modeling outline and the yield of this outline procedure is a portrayal of the product structural planning. The proposed architecture for this system is given below. It shows the way this system is designed and brief working of the system.

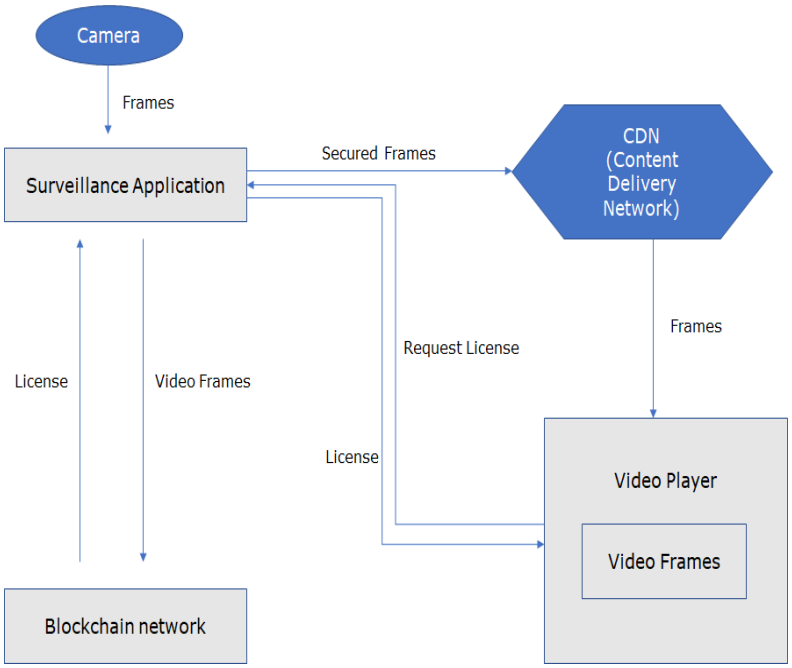

Fig 1: System Architecture

➢ IMPEMENTATION

Prototype of the Project:

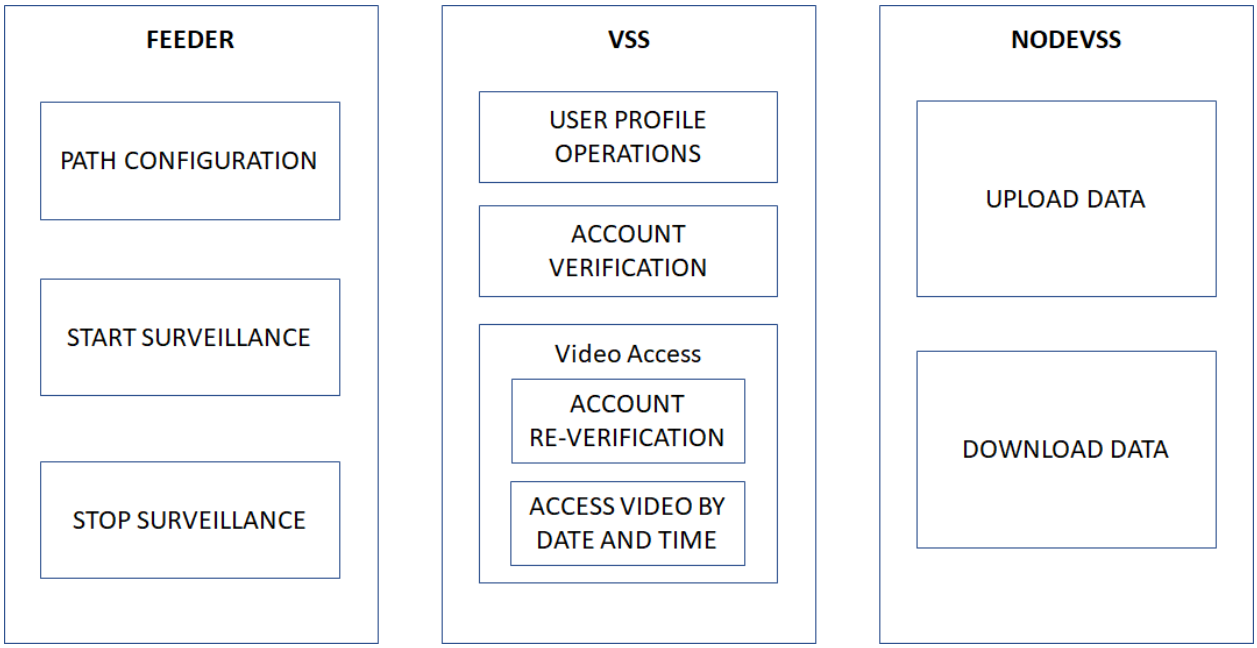

Fig 2: Implementation of the overall System

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Feeder Application:

Feeder application is developed using Java-EE framework. This application is installed at the physical premises where the surveillance camera has to be installed (Ex: Shopping malls, Hospitals, Colleges, Offices, Shops, etc). Since this application is installed at a particularpremises, only the admin/owner of the premises will have an access to this application. The Feeder application will provide the following three operations to the admin:

- Path Configuration: This is the configuration admin has to do before performing the surveillance operation. Here the admin will have select/specify the path where the surveillance video frames will be temporarily stored before they picked up by the bridge which uploads to the blockchain network
- Start Surveillance: The admin can start the surveillance operation. The video camera starts collecting the frames and dump them into the path configured above which will eventually be picked up by the bridge and pushed to the blockchain network
- Stop Surveillance: The admin can stop the surveillance operation.

Blockchain Node:

This Module implements the Blockchain Node. A node is the one which will have the entire blockchain data stored in it. The node will get the blockchain data when the Feeder components' bridge picks up all the frames from the configured path and constructs the blockchain out of it and then eventually uploads it to the Blockchain Node. There would be multiple blockchain nodes. More the number of nodes, stronger the security of the blockchain data. The blockchain Node application provides the two operations. Upload data and Download data to push and get the blockchain data correspondingly

VSS Application

This application provides the following four operations to the end users

- **User Profile Operations**: This module implements the basic user profile operations on the prototype application. The user profile operations include creating a new account, logging in to the existing account, logging out, editing the profile, changing the password, and deleting the profile if not needed anymore. This application is also deployed on the cloud server so that this can be accessed by anyone across the globe using the IP address of this cloud server. The implementation is done using the J2EE architecture and for the database needs we have used SQLITE3.
- **User Profile Verification:** Here, the user will have to verify their email ID and the mobile number specified during the registration operation. The system will generate an OTP separately for email and mobile and sends it to the user. The user will then have to provide the OTP in order to verify his/her profile. Without the profile verification, the system doesn't allow the user to download the video footage from the blockchain network.
- **Profile re-verification:** Here, the user will have to prove his/her identity again in order to verify that his/her session is not hacked by someone else. This re-verification is done in the same way as the profile operation. i.e, through sending an OTP to user's mobile number and email ID.
- **Video Retrieval:** Once the profile re-verification is done, the user will then get to select the date and time of the video at which he/she wants to retrieve for performing the monitoring operation. And then the system downloads the video from that date and time and provides the same to the user.

V. RESULT

The Users who want to access the videos which are uploaded into the blockchain can register themselves in the "BLOCKCAIN VSS" website. They are provided with all the options to change their password or their credentials in case they want to edit. The users need to verify themselves by providing the portal with their registered email and phone number, a code will be sent to both, by entering both the codes in the portal a user gets verified. After his/her verification the user can download the desired videos which are present in the blockchain network in a read only format i.e, he/she can only view the videos and cannot make any changes to it.

Snapshots from the website:

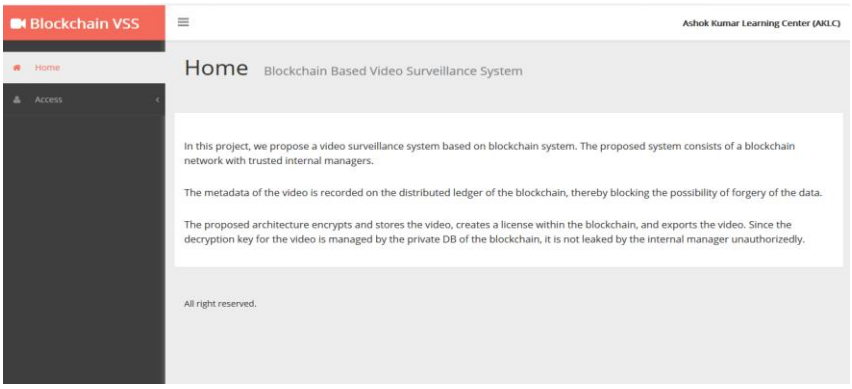

Fig 3: Index Page

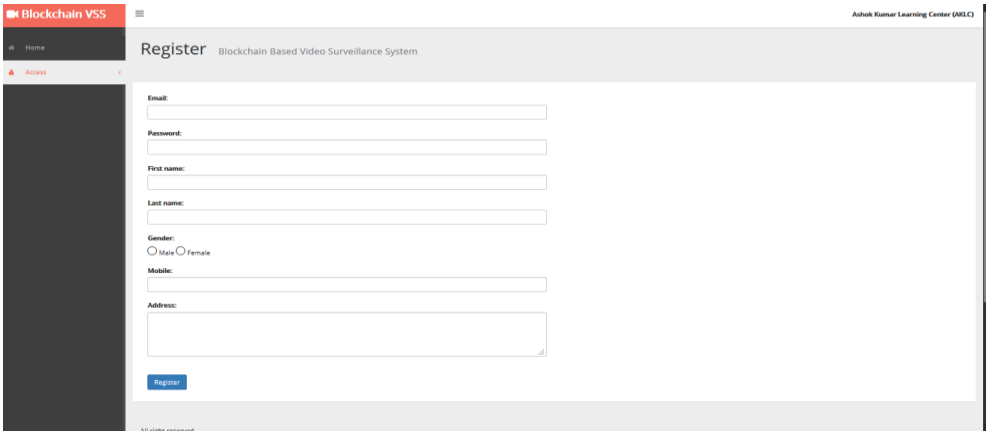

Fig 4: Register page

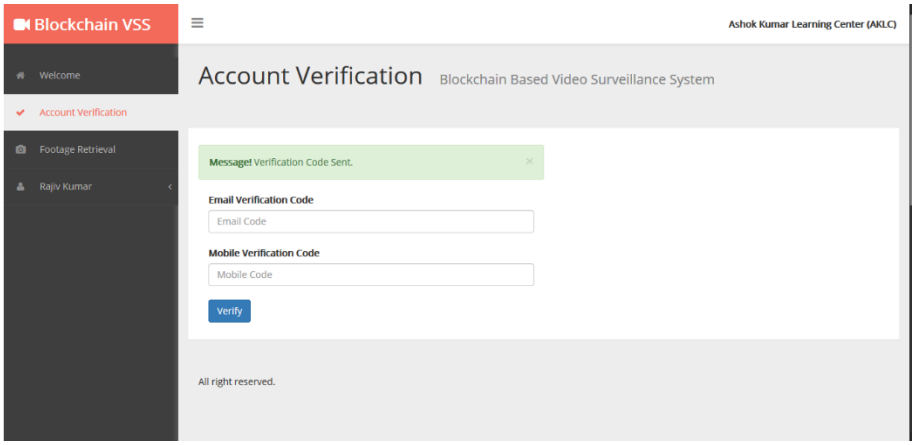

Fig 5: Account Verification page

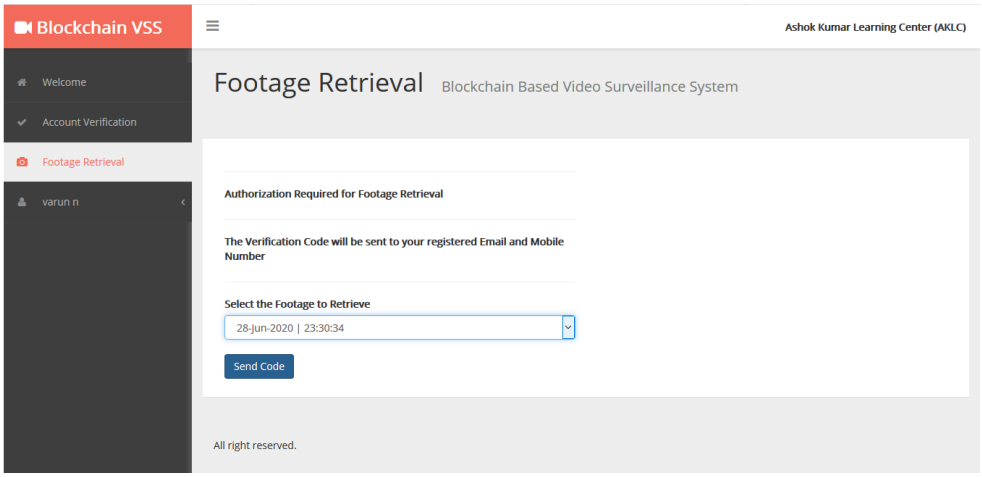

Fig 6: Footage Retrieval Page

VI.CONCLUSION AND FUTURE WORK

In this project, we propose a video surveillance system based on blockchain. Videos recorded from IP cameras are encrypted and stored in IPFS through a private blockchain network composed of trusted administrators. The decryption key for the video is not stored in the block but stored in the DB of the specific node having the collection authentication authority so that the internal manager cannot confirm the decryption key. Also, when a person who wants to view a video receives approval from the blockchain network or an internal manager monitors video on the screen, the internal manager executes a verification algorithm for exporting the video. In the verification algorithm, the code is sent to users email and mobile In the proposed blockchain structure, the video surveillance system can securely manage videos from external persons and internal administrators. Also, it is possible to manage the objective record whether the video export is well managed.

In Future, we aim at extending the solution across multiple nodes and scaling it to a large cluster of videos using Big data computing environment.

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