

Blockchain-Based Criminal Information Management System in Sri Lanka

GROUP ID: 23-270

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Smart Contract for
Blockchain
IT20150952

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Authentication
System
IT20171438

04

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Management System
IT20157814

05

Chain of Custody
IT19983370

Group Members



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Project Details

- Project ID: 23-270
- Supervisor: Mr. Kanishka Yapa
- Co-Supervisor: Ms. Dinihi Pandithage

01

Overall Project Description

Introduction

- This project aims to develop a blockchain-based criminal information management system as an improvement of the existing criminal information management method in Sri Lankan.
- Why we need blockchain technology ?
 - It helps improve data security, transparency and efficiency in managing criminal records



Introduction

- Who will get benefits from Blockchain based Criminal Information management system ?
 - Law Enforcement Authorities
 - Police Officers
 - Lawyers
 - Police Departments
 - Law Enforcement Agencies



Research Question

How can a blockchain-based criminal information management system be implemented effectively in Sri Lanka to enhance data security, transparency, and efficiency in the criminal system ?

- Understand the Current policy and procedure of Criminal System in Sri Lanka.
- Identify the Stakeholders
- Define the System Requirements
- Develop a Blockchain platform



Research Problem

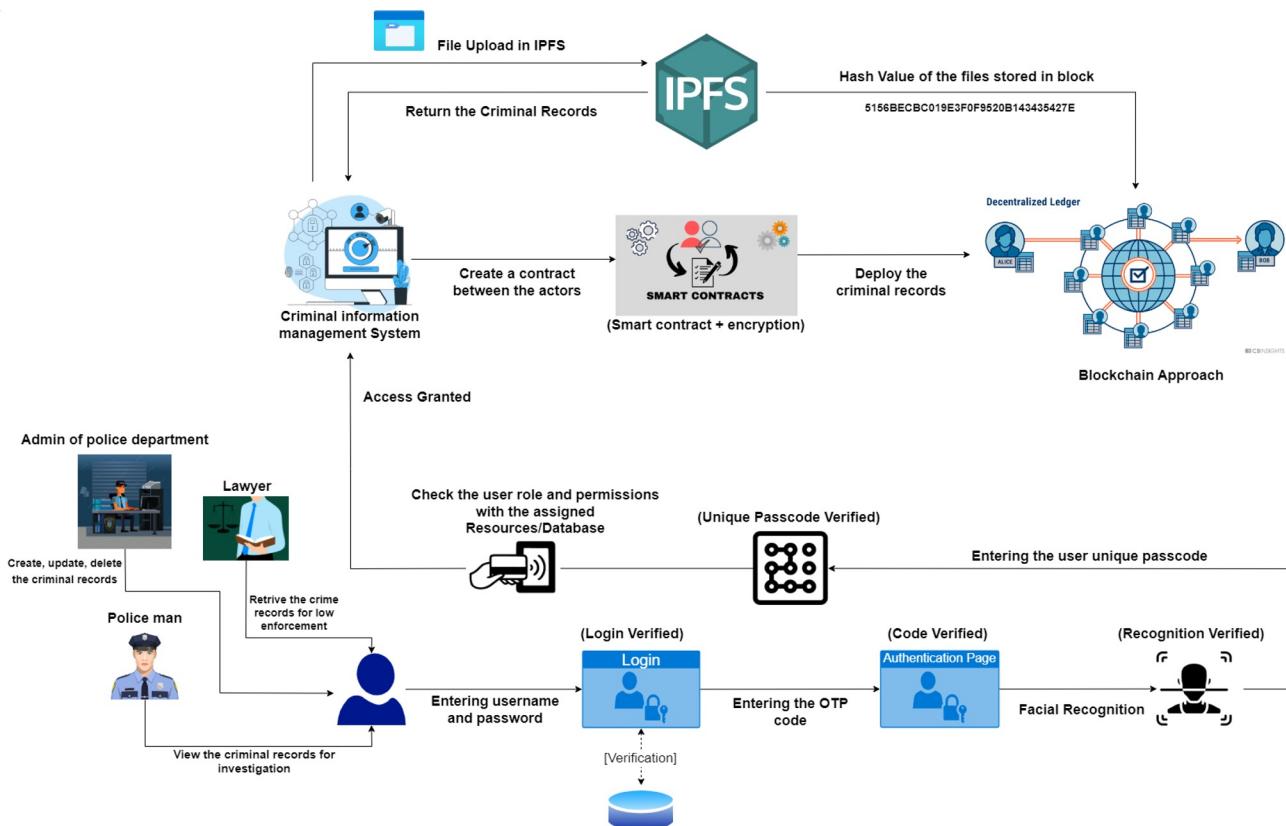
- Lack of integration
- Inconsistent data quality
- Privacy and security concern
- Insufficient process

Objectives

- SMART CONTRACT
- AUTHENTICATION SYSTEM
- INTERPLANETARY FILE SYSTEM
- CHAIN OF CUSTODY

- | Deployment of Criminal Records in blockchain
- | Prevent from the Unauthorized access
- | To Secure Store criminal Evidence Document
- | High level of security for records verification

Overall System Diagram



02

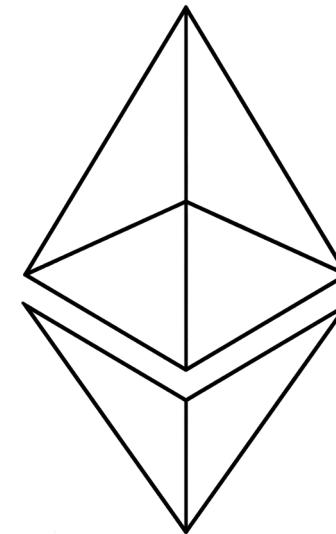
Implementing Smart Contract For Blockchain



IT20150952 | BRAHANAWARDHAN B.
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Sub Objective

- Implementing Blockchain network for Criminal information Management System using Smart Contracts



Research Problem

- How to ensure the Confidentiality, Integrity, Availability of Criminal records ?
 - Challenges currently encountered by the Criminal information management System ?
 - Interoperability
 - Scattered Criminal Records
 - Handfill Documents
 - Integrity problem
 - Local databases



Objectives Achieved

- Increased efficiency, transparency, and Security
- Ensured Confidentiality, Integrity, Availability
- Reduced the lack of Consistency
- Increased the performance and usability of Criminal Records.



Risk & Solution

Risks

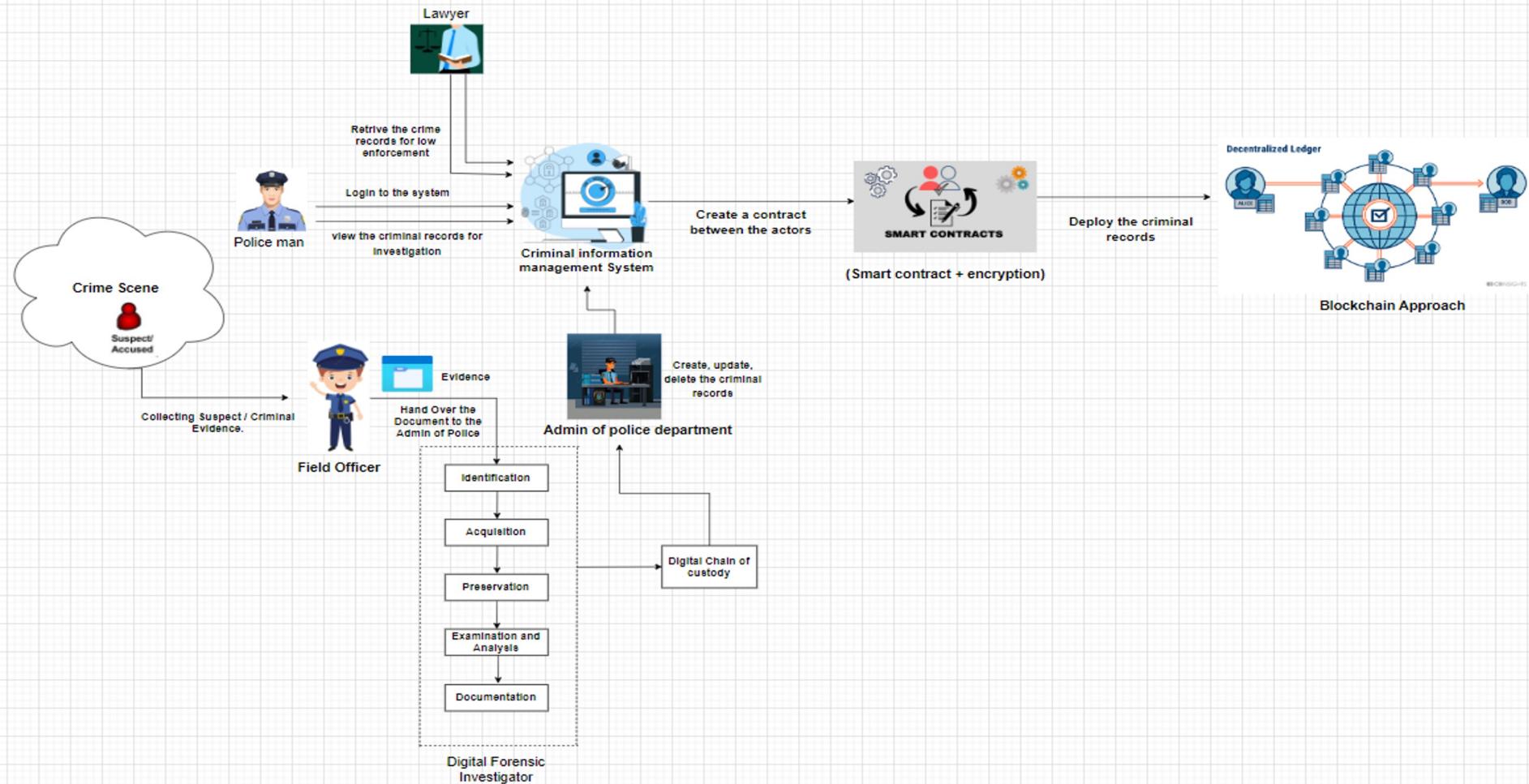
- Data Privacy Concerns
- Immutable Records
- Regulatory Compliance : GDPR, HIPAA



Solution

- Smart Contracts for Data Management.
- Regular Audits and Monitoring.

System diagram and possible solution



Progress up to Progress presentation - 01

Criminal Registration Form

Criminal Name

Age

NIC No

Crime

Police Station

Register

Deployed Contracts

CRIMINALINFORMATION AT 0x31

Balance: 0 ETH

addRecord

_name:	kamal
_age:	22
_crime:	Murder
_nicNo:	200016902050
_policeStation:	Kandy

getRecord

_recordId:	5
------------	---

0: string: kamal
1: uint256: 22
2: string: Murder
3: string: 200016902050
4: string: Kandy

getTotalRecords

0: uint256: 6

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE	QUICKSTART	SAVE	SWITCH	⚙️
7	20000000000	6721975	MERGE	5777	HTTP://127.0.0.1:7545	AUTOMINING					
BLOCK 7	MINED ON 2023-05-24 13:43:37				GAS USED 151620			1 TRANSACTION			
BLOCK 6	MINED ON 2023-05-24 13:43:35				GAS USED 151620			1 TRANSACTION			
BLOCK 5	MINED ON 2023-05-24 13:43:34				GAS USED 151620			1 TRANSACTION			
BLOCK 4	MINED ON 2023-05-24 13:43:33				GAS USED 151620			1 TRANSACTION			
BLOCK 3	MINED ON 2023-05-24 13:43:31				GAS USED 151620			1 TRANSACTION			
BLOCK 2	MINED ON 2023-05-24 13:29:56				GAS USED 168720			1 TRANSACTION			
BLOCK 1	MINED ON 2023-05-24 13:17:03				GAS USED 926792			1 TRANSACTION			
BLOCK 0	MINED ON 2023-05-24 13:14:33				GAS USED 0			NO TRANSACTIONS			

Progress up to Progress presentation - 01

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK 1	GAS PRICE 20000000000	GAS LIMIT 6721975	HARDFORK MERGE	NETWORK ID 5777	RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	WORKSPACE QUICKSTART	SAVE	SWITCH	⚙️	
BLOCK 1	MINED ON 2023-05-24 13:17:03					GAS USED 926792	1 TRANSACTION				
BLOCK 0	MINED ON 2023-05-24 13:14:33					GAS USED 0	NO TRANSACTIONS				

ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK 1	GAS PRICE 20000000000	GAS LIMIT 6721975	HARDFORK MERGE	NETWORK ID 5777	RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	WORKSPACE QUICKSTART	SAVE	SWITCH	⚙️	
TX HASH 0x5ebe28bf62dec51710759e1b2f3cb77180fb4628b807bc86acf36bf8ec191a61											
FROM ADDRESS 0x365a5C34415ec724cb1626b091F884B4537f514c			CREATED CONTRACT ADDRESS 0x3F8Eb8afa36474479C484c9290CfB4cCeCbB9A71				GAS USED 926792	VALUE 0	CONTRACT CREATION		

Progress up to Progress presentation - 02

CRISYS Add Records View Records

SignOut

Name
Nimal

Age
26

Crime
Murder

Nic No
200116902050

Police Station
Colombo

Evidence Collected
Fingerprint and CCTV Footage

Evidence ID
QmU2WXGv41MMHWp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog

Crime Date
09/07/2023

Crime Time
10:44 AM

Police Officer
Officer Namal

CrimeCount
4

Submit

Progress up to Progress presentation - 02

CRISYS Add Records View Records

SignOut

View Records

Name	Age	Crime	NicNo	PoliceStation	Evidence Collected	Evidence ID	CrimeDate	CrimeTime	PoliceOfficer	CrimeCount
kamal	30	Murder	200016902050	maradhana	CCTV Footage	QmU2WXGv41MMHWp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog	2023-09-07	10:00	Nimal	3
Nimal	26	Murder	200116902050	Colombo	Fingerprint and CCTV Footage	QmU2WXGv41MMHWp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog	2023-09-07	10:44	Officer Namal	4

Progress up to Progress presentation - 02

ACCOUNTS	BLOCKS	TRANSACTIONS	CONTRACTS	EVENTS	LOGS	SEARCH FOR BLOCK NUMBERS OR TX HASHES	WORKSPACE	SAVE	SWITCH	SETTINGS
CURRENT BLOCK 2	GAS PRICE 20000000000	GAS LIMIT 6721975	HARDFORK MERGE	NETWORK ID 5777	RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	QUICKSTART			
Mnemonic						HD Path				
there estate glide fruit thank unique winter catalog payment box dance cause						m44'60'0'0account_index				
ADDRESS 0xC828F6d2D75Dc1450eDC432110f41b459Cd5E642	BALANCE 99.99 ETH					TX COUNT 2	INDEX 0			KEY
ADDRESS 0x034D398E6dc4FBB5B13182d664e221fDf86e3199	BALANCE 100.00 ETH					TX COUNT 0	INDEX 1			KEY
ADDRESS 0x463F2b1Fc01689B7A1C126cd774dFB5D3D34286	BALANCE 100.00 ETH					TX COUNT 0	INDEX 2			KEY
ADDRESS 0xb3ae594a8819817aD9aA51902f47b016BB4785a1	BALANCE 100.00 ETH					TX COUNT 0	INDEX 3			KEY
ADDRESS 0x955BC7ee7Ab16b2cbe8a1eE62008D9e2aED9f52f	BALANCE 100.00 ETH					TX COUNT 0	INDEX 4			KEY
ADDRESS 0x3FC612E1ce3c8b324fDFC334502674ADB5735F8F	BALANCE 100.00 ETH					TX COUNT 0	INDEX 5			KEY

Progress up to Progress presentation - 02

A screenshot of a blockchain dashboard. At the top, there are navigation icons for Accounts, Blocks (highlighted in orange), Transactions, Contracts, Events, and Logs. A search bar at the top right allows searching for block numbers or tx hashes. Below the header, a row of settings includes Current Block (2), Gas Price (200000000000), Gas Limit (6721975), Hardfork Merge, Network ID (5777), RPC Server (HTTP://127.0.0.1:7545), and Mining Status (AUTOMINING). Buttons for Save, Switch, and Quickstart are also present. The main content area displays three blocks: Block 2 was mined on 2023-09-06 16:45:44 with gas used 362987, Block 1 was mined on 2023-09-06 16:42:22 with gas used 1222407, and Block 0 was mined on 2023-09-06 16:41:55 with gas used 0. A '1 TRANSACTION' button is shown next to each block.

BLOCK 2	MINED ON 2023-09-06 16:45:44	GAS USED 362987	1 TRANSACTION
BLOCK 1	MINED ON 2023-09-06 16:42:22	GAS USED 1222407	1 TRANSACTION
BLOCK 0	MINED ON 2023-09-06 16:41:55	GAS USED 0	NO TRANSACTIONS

A detailed view of Block 2. The top navigation and settings are identical to the previous dashboard. The main content shows the block details again: Gas Used 362987, Gas Limit 6721975, Mined On 2023-09-06 16:45:44, and Block Hash 0x2eea0abfcf38871b29ba24cb7050a4d3204fb6f7a5c7582a8361c6fad80893c6. Below this, a table lists the transaction details: From Address 0xC828F6d2D75Dc1450eDC432110f41b459Cd5E642, To Contract Address 0xD618C7a00C308A33A1C7BF77fd9b08ddF5412606, Gas Used 362987, and Value 0. A 'CONTRACT CALL' button is located to the right of the transaction details.

BLOCK 2			
GAS USED 362987	GAS LIMIT 6721975	MINED ON 2023-09-06 16:45:44	BLOCK HASH 0x2eea0abfcf38871b29ba24cb7050a4d3204fb6f7a5c7582a8361c6fad80893c6
TX HASH 0x6c9f4e95d32e0902264a507a9ab39f90b632ee226d1c68f7f32aefef7f0f7d54c	FROM ADDRESS 0xC828F6d2D75Dc1450eDC432110f41b459Cd5E642	TO CONTRACT ADDRESS 0xD618C7a00C308A33A1C7BF77fd9b08ddF5412606	GAS USED 362987

Progress up to Progress presentation - 02

The screenshot shows a Postman API client interface. At the top, the URL is set to `http://localhost:4000/api/v1/record`. The method is selected as `GET`. Below the URL, there are tabs for `Params`, `Authorization`, `Headers (8)`, `Body`, `Pre-request Script`, `Tests`, and `Settings`. The `Params` tab is currently active. In the `Query Params` section, there is one entry: `Key` with a value of `Value`. On the right side of the interface, there are buttons for `Save`, `Edit`, and `Send`.

Below the header, the `Body` tab is selected. It displays the response from the API. The status bar indicates `Status: 200 OK`, `Time: 305 ms`, and `Size: 917 B`. The response body is shown in `Pretty` format:

```
1
2
3   {
4     "_id": "64f85f0dda650698a4119782",
5     "Name": "kamal",
6     "Age": "30",
7     "Crime": "Murder",
8     "NicNo": "200016902050",
9     "PoliceStation": "maradhana",
10    "EvidenceCollected": "CCTV Footage",
11    "EvidenceID": "QmU2WXGv41MMHwp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog",
12    "CrimeDate": "2023-09-07",
13    "CrimeTime": "10:00",
14    "PoliceOfficer": "Nimal",
15    "CrimeCount": "3"
16  },
17  {
18    "_id": "64f87bfc1686b07f53383e61",
19    "Name": "Nimal",
20    "Age": "26",
21    "Crime": "Murder",
22    "NicNo": "200016902050",
23    "PoliceStation": "Colombo",
24    "EvidenceCollected": "Fingerprint and CCTV Footage",
```

Progress up to Progress presentation - 02

The screenshot shows a Postman interface with the following details:

- Request URL:** `http://localhost:4000/api/v1/record`
- Method:** POST
- Body:** JSON (selected)
- JSON Body Content:**

```
1
2
3     "Name": "Nimal",
4     "Age": "26",
5     "Crime": "Murder",
6     "NicNo": "200116902050",
7     "PoliceStation": "Colombo",
8     "EvidenceCollected": "Fingerprint and CCTV Footage",
9     "EvidenceID": "QmU2WXGv41MMHWp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog",
10    "CrimeDate": "2023-09-07",
11    "CrimeTime": "10:44",
12    "PoliceOfficer": "Officer Namal",
13    "CrimeCount": "4"
14
15
```
- Response Status:** 201 Created
- Response Time:** 314 ms
- Response Size:** 607 B
- Response Body (Pretty JSON):**

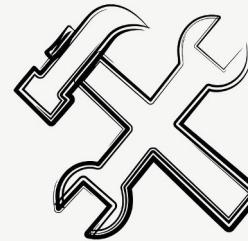
```
1
2
3     "Name": "Nimal",
4     "Age": "26",
5     "Crime": "Murder",
6     "NicNo": "200116902050",
7     "PoliceStation": "Colombo",
8     "EvidenceCollected": "Fingerprint and CCTV Footage",
9     "EvidenceID": "QmU2WXGv41MMHWp2LtSrf2Z81jE5DAw4CKvHwGKBuszhog",
10    "CrimeDate": "2023-09-07",
11    "CrimeTime": "10:44",
12    "PoliceOfficer": "Officer Namal",
13    "CrimeCount": "4",
14    "_id": "64f87f2a1686b07f53383e6d"
```

Demonstration



Methodology

- IDE : Remix (Ethereum) IDE, VS Code
- Programming Language: Solidity, JS
- Front- end: React JS
- Blockchain Platform: Ganache Personal Blockchain (Truffle Suite)
- Project Management : Trello, Ms Planner



Pending Works

- Input Validation for Criminal information entry form.
- Design modification for Front-end development.
- Integrated with final Product.



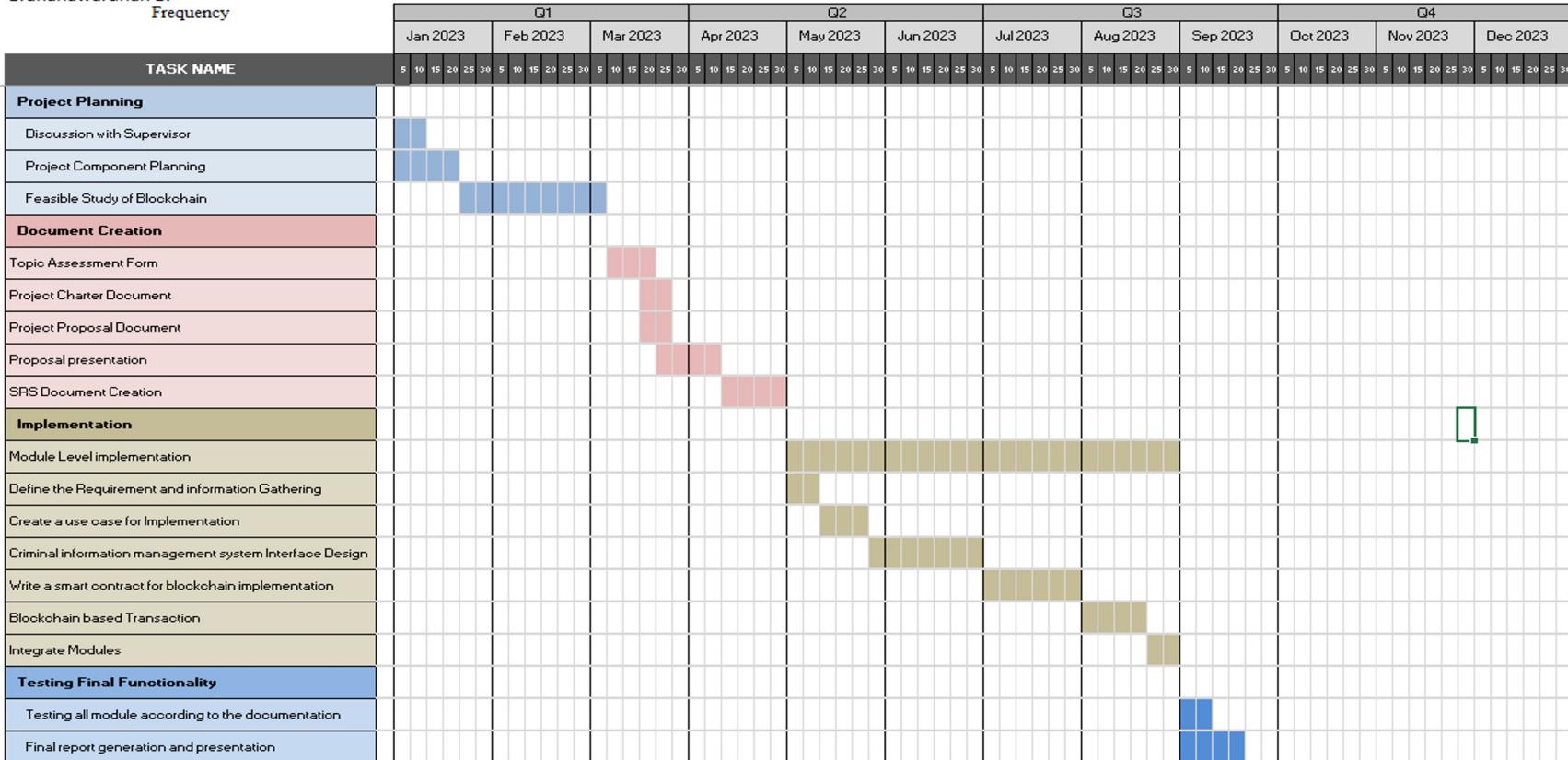
Gantt Chart

Research Project - Timeline

Sri Lanka Institute of Information Technology (SLIIT)

Brahanawardhan B.

Frequency



References

- “Blockchain-based Criminal Record Database Management.” [Online]. Available: <https://ieeexplore.ieee.org/document/9544655>. [Accessed: 19-Mar-2023].
- “Crab: Blockchain based Criminal Record Management System.” [Online]. Available: https://www.researchgate.net/publication/329489346_CRAB_Blockchain_Based_Criminal_Record_Management_System. [Accessed: 19-Mar-2023].
- “Blockchain-based Criminal Record Database Management.” [Online]. Available: <https://ieeexplore.ieee.org/document/9544655>. [Accessed: 19-Mar-2023].
- Wust, K., Gipp, B., & Breitenbücher, U. (2018). “Blockchain in forensic science: Securing digital evidence”. In 2018 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO) (pp. 1350– 1355). IEEE.

03

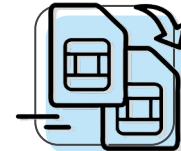
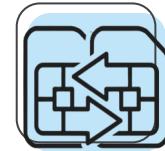
Authentication System



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Specializing in Cyber Security

Research Question

- How To Secure System Login By Implementing A Secure Authentication System To The Blockchain- Based Criminal Information Management System In Sri Lanka?
- Is 2-Factor Authentication SECURE? Can 2-Factor Authentication be HACKED?
 - SIM Swapping
 - SIM Cloning
 - Man-in-the-Middle Attacks
 - Phishing Attacks
 - Social Engineering



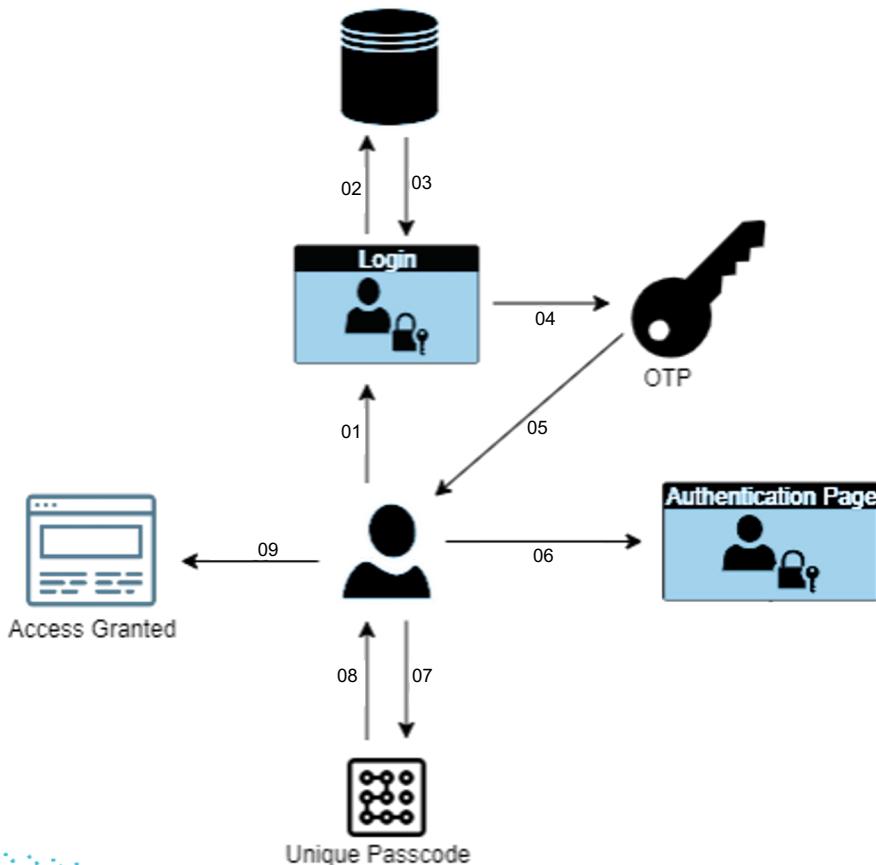
Research Gap

CONSIDERATION ON	EXISTING SYSTEMS	PROPOSED SYSTEM
1ST FACTOR	Security Level is LOW	Security Level is HIGH
2ND FACTOR	Security Level is MODERATE	Security Level is HIGH
CONFIDENTIALITY	Security Level is LOW	Security Level is HIGH
INTEGRITY	Security Level is LOW	Security Level is HIGH
POSSIBLE OTP COMBINATIONS	LOW (59,049)	HIGH (60,466,176)
OVERALL SYSTEM	Security Level is MODERATE	Security Level is HIGH

Specific & Sub Objectives

- Proposed Authentication System;
 - Two-Factor Authentication (2FA) System
 - Additional Layer of Security Implemented at the End.
- The 1st Factor;
 - Username and Password
- The 2nd Factor;
 - One-Time Password
- Additional Layer of Security;
 - System Generated Unique Passcode

System Diagram



System Description

- 1st Factor;
 - Highest-level of Security Standards
 - Alerts Generated
 - Number of Attempts
- 2nd Factor;
 - 6-Digit Code → 6-Character Code
60,466,176]
 - Number of Attempts
 - Time Restriction
- Additional Layer of Security;
 - Unique System Generated Code
 - Code Expiration

[59,049 →



Requirements

Functional Requirements

- User Registration
- Factor Options
- Factor Management
- Authentication Workflow
- Integration with Applications
- Authentication Logging

Non-Functional Requirements

- Security
- Performance
- Reliability
- Usability
- Scalability
- Compliance

Layouts

The image displays a composite of two visual elements. At the top is a horizontal banner with a yellow and black distressed texture. It features the words "DO NOT CROSS" repeated twice in large, bold, black capital letters. Below this banner is a screenshot of a web application interface. The interface has a dark header bar with a blue navigation bar containing links for "Home", "User", "Police", and "Admin". The main content area is white and contains the CRISYS logo, which consists of a stylized 'C' and 'S' icon above the word "CRISYS" in red, all set against a dark background.

Mission & Vision

The mission of CRISYS is to enhance the efficiency, transparency, and security of criminal information management processes.

It aims to streamline information exchange among law enforcement agencies and stakeholders, contributing to more effective crime prevention and justice delivery. The vision of CRISYS is to create a unified and

Layouts

Crime Information Management System

[SIGN UP](#)

Full Name

E-mail Address

Mobile Number

Password

Please make sure it meets the requirements

- X Password must be between 10 and 15 characters.
- X Password must contain at least one uppercase letter.
- X Password must contain at least one digit.
- X Password must contain at least one special character.

[Sign Up](#)

Crime Information Management System

[SIGN IN](#)

Email

Password

[Sign In](#)

[Lost Password?](#)

Crime Information Management System

[SIGN IN](#)

Police ID

Password

[Sign In](#)

[Lost Password?](#)

Crime Record Management System

[SIGN IN](#)

Username

Password

Remember Me

[Sign In](#)

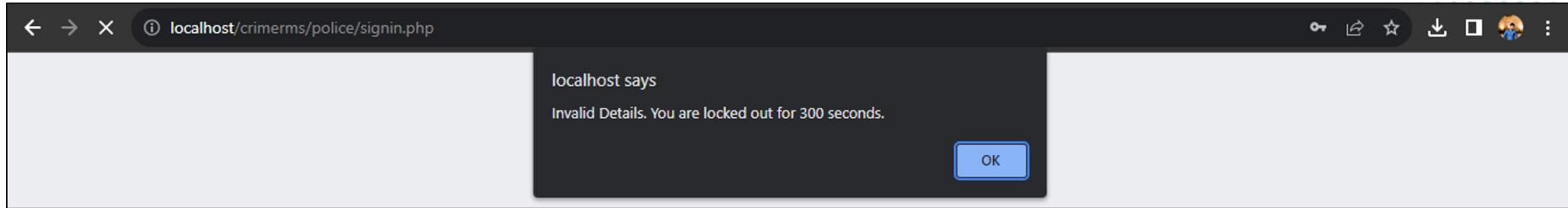
[Lost Password?](#)

Layouts

you have been sent an email with the OTP code. please check and give

The image displays a two-part interface. On the left, a light gray background contains a dark blue header bar with the text "One-Time Password". Below this is a white rectangular form with a blue header bar containing a bell icon and the text "OTP". The form has a label "OTP Code" and a text input field with a lock icon containing the placeholder "Enter Your OTP Code". A blue "Sign In" button is at the bottom. On the right, a dark-themed mobile-style email inbox shows an incoming message from "OTP CODE" with the subject "OTP Code" received at "11:10 PM" to the user. The message body displays the text "The OTP code is" followed by the code "8OXvSr".

Layouts



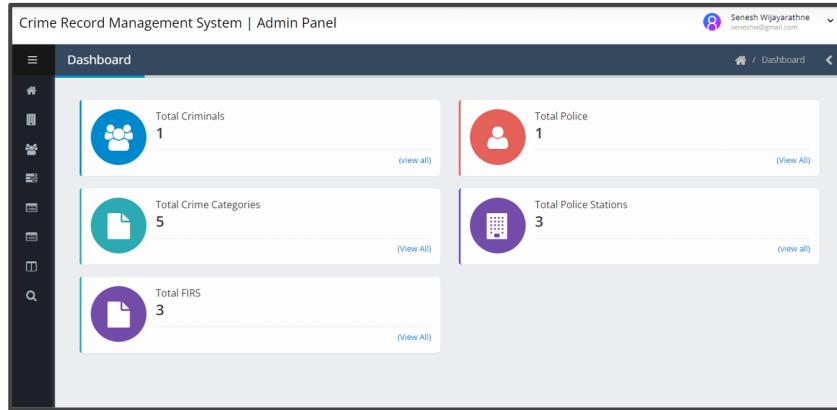
Layouts

Crime Record Management System | Admin Panel

Senesh Wijayarathne
seneshw@gmail.com

Dashboard

- Total Criminals 1 (View All)
- Total Police 1 (View All)
- Total Crime Categories 5 (View All)
- Total Police Stations 3 (View All)
- Total FIRS 3 (View All)

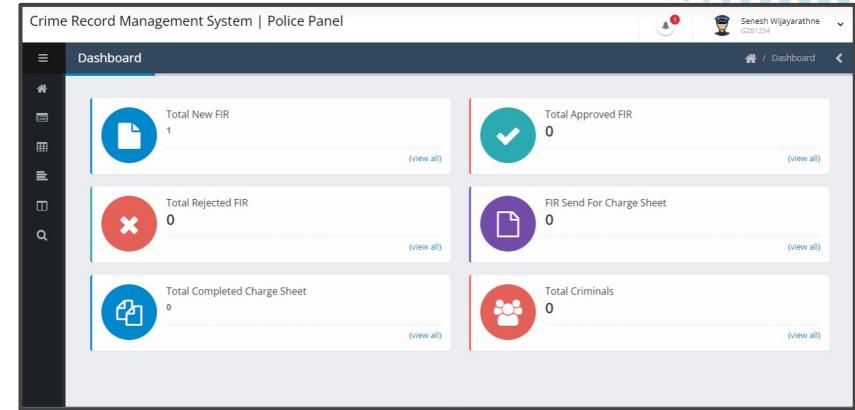


Crime Record Management System | Police Panel

Senesh Wijayarathne
G2B1234

Dashboard

- Total New FIR 1 (View All)
- Total Approved FIR 0 (View All)
- Total Rejected FIR 0 (View All)
- FIR Send For Charge Sheet 0 (View All)
- Total Completed Charge Sheet 0 (View All)
- Total Criminals 0 (View All)

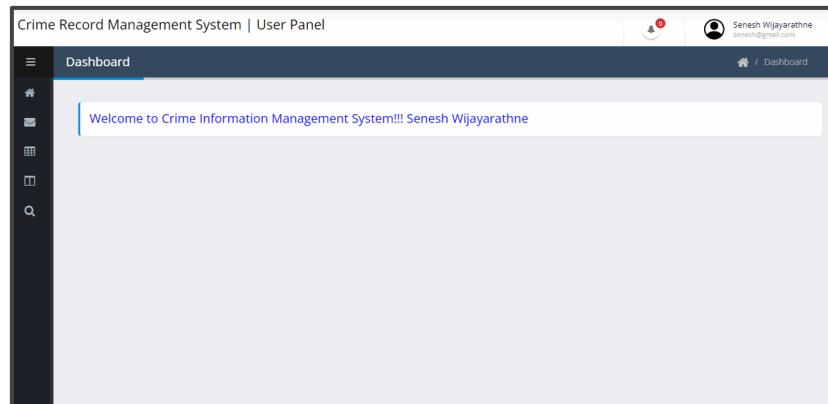


Crime Record Management System | User Panel

Senesh Wijayarathne
seneshw@gmail.com

Dashboard

Welcome to Crime Information Management System!!! Senesh Wijayarathne



Layouts

Crime Record Management System | Admin Panel

Admin Profile

Admin Name * Senesh Wijayarathne
User Name * seneshw
Email seneshw@gmail.com
Contact Number * 777207753
Admin Registration Date * 2023-05-20 12:54:44

Update

Crime Record Management System | Police Panel

Profile

Your ID * GZB1234
Name * Senesh Wijayarathne
Email * seneshw@gmail.com
Contact Number * 777207753
Address 232, Sadasipura, Athurugiriy
Joining Date * 2023-05-20 20:29:45

Update

Crime Record Management System | User Panel

Profile

User Profile

Name * Senesh Wijayarathne
Email * senesh@gmail.com
Contact Number 777207753
Registration Date * 2023-05-23 19:12:10

Update

Backend

signup.php

```
122
123
124     $(document).ready(function() {
125         $('#password').on('input', function() {
126             var password = $(this).val();
127             var regex = /^(?=.*[A-Z])(?=.*\d)(?=.*[@$%^&*()_+={};<>]).{10,15}$/;
128
129             var hasUpperCase = /[A-Z]/.test(password);
130             var hasDigit = /\d/.test(password);
131             var hasSpecialChar = /[!@#$%^&*()_+={};<>]/.test(password);
132             var isLengthValid = (password.length >= 10 && password.length <= 15);
133
134             var criteriaList = $('#passwordCriteria');
135             criteriaList.empty();
136
137             if (!isLengthValid) {
138                 criteriaList.append('<li> Password must be between 10 and 15 characters.</li>');
139             } else {
140                 criteriaList.append('<li class="valid">✓ Password must be between 10 and 15 characters.</li>');
141             }
142
143             if (!hasUpperCase) {
144                 criteriaList.append('<li> Password must contain at least one uppercase letter.</li>');
145             } else {
146                 criteriaList.append('<li class="valid">✓ Password must contain at least one uppercase letter.</li>');
147             }
148
149             if (!hasDigit) {
150                 criteriaList.append('<li> Password must contain at least one digit.</li>');
151             } else {
152                 criteriaList.append('<li class="valid">✓ Password must contain at least one digit.</li>');
153             }
154
155             if (!hasSpecialChar) {
156                 criteriaList.append('<li> Password must contain at least one special character.</li>');
157             } else {
158                 criteriaList.append('<li class="valid">✓ Password must contain at least one special character.</li>');
159             }
160
161             if (!regex.test(password)) {
162                 $('#passwordFeedback').text('Please make sure it meets the requirements');
163             } else {
164                 $('#passwordFeedback').text('');
165             }
166         });
167     });
168 
```

signin1.php

```
1 <?php
2     session_start();
3     error_reporting(0);
4     include('includes/dbconnection.php');
5     $maxAttempts = 5; // Maximum number of login attempts
6     $lockoutTime = 300; // Lockout time in seconds (5 minutes)
7     $extendedLockoutTime = 3600; // Extended lockout time in seconds (1 hour)
8     if (isset($_SESSION['login_attempts']) && $_SESSION['login_attempts'] >= $maxAttempts) {
9         // User is locked out, check lockout time
10        $lockoutEndTime = $_SESSION['lockout_time'] + $lockoutTime;
11        if (time() < $lockoutEndTime) {
12            $remainingTime = $lockoutEndTime - time();
13            echo "<script>alert('You are locked out. Please try again after $remainingTime seconds.');//</script>";
14            exit();
15        } else {
16            // Lockout time has expired, reset login attempts
17            unset($_SESSION['login_attempts']);
18            unset($_SESSION['lockout_time']);
19        }
20    }
21    if (isset($_POST['login'])) {
22        $pid = $_POST['pid'];
23        $password = md5($_POST['password']);
24        $sql = "SELECT ID, PID, PoliceStationID FROM tblpolice WHERE PID = :pid AND Password = :password";
25        $query = $dbh->prepare($sql);
26        $query->bindParam(':pid', $pid, PDO::PARAM_STR);
27        $query->bindParam(':password', $password, PDO::PARAM_STR);
28        $query->execute();
29        $results = $query->fetchAll(PDO::FETCH_OBJ);
30        if ($query->rowCount() > 0) {
31            foreach ($results as $result) {
32                $_SESSION['crmspid'] = $result->ID;
33                $_SESSION['crmspid'] = $result->PID;
34                $_SESSION['pid'] = $result->PoliceStationId;
35            }
36            $_SESSION['login'] = $_POST['pid'];
37            unset($_SESSION['login_attempts']); // Reset login attempts
38            echo "<script type='text/javascript'> document.location ='otp02.php'; </script>";
39        } else {
40            if (!isset($_SESSION['login_attempts'])) {
41                $_SESSION['login_attempts'] = 1;
42            } else {
43                $_SESSION['login_attempts']++;
44            }
45            if ($_SESSION['login_attempts'] >= $maxAttempts) {
46                // Reached maximum login attempts
47                $_SESSION['lockout_time'] = time(); // Set lockout time
48                echo "<script>alert('Invalid Details. You are locked out for $lockoutTime seconds.');//</script>";
49                exit();
50            } else {
51                echo "<script>alert('Invalid Details');//</script>";
52            }
53        }
54    }
55 ?>
```

Backend

send-email.php

```
1  <?php
2  use PHPMailer\PHPMailer;
3
4  require_once 'PHPMailer/src/Exception.php';
5  require_once 'PHPMailer/src/PHPMailer.php';
6  require_once 'PHPMailer/src/SMTP.php';
7
8  $mail = new PHPMailer(true);
9
10 if(isset($_POST['submit'])){
11     $OTPcode = $_POST['name'];
12
13     try{
14         $mail->isSMTP();
15         $mail->Host = 'smtp.gmail.com';
16         $mail->SMTPAuth = true;
17         $mail->Username = 'yourmail@gmail.com'; //Need to enter Username
18         $mail->Password = '[Password]'; //Need to enter the Password
19         $mail->SMTPSecure = "tls";
20         $mail->Port = '587';
21
22         $mail->setFrom('yourmail@gmail.com'); //Need to enter Username
23         $mail->addAddress('Gmail Address'); //Need to read the file from the DB and config data
24
25         $mail->isHTML(true)
26         $mail->Subject = 'Your One-Time Password is!: $OTPcode';
27         $mail->Body = "Please enter the following as your One-Time Password to login to the system. <br>One-Time Password: $OTPCode";
28     }
29 }
30
31 }
```

otp02.php

```
1  <?php
2  session_start();
3  error_reporting(0);
4  include('includes/dbconnection.php');
5  // Function to generate a random 6-character password
6  function generatePassword() {
7      $characters = '0123456789abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ';
8      $password = '';
9      for ($i = 0; $i < 6; $i++) {
10          $index = rand(0, strlen($characters) - 1);
11          $password .= $characters[$index];
12      }
13      return $password;
14  }
15  // Set or retrieve the password from the session
16  if (isset($_SESSION['password'])) {
17      $password = $_SESSION['password'];
18  } else {
19      $password = generatePassword();
20      $_SESSION['password'] = $password;
21  }
22  // Set or retrieve the expiration time from the session
23  if (isset($_SESSION['expiration'])) {
24      $expiration = $_SESSION['expiration'];
25  } else {
26      $expiration = time() + 60;
27      $_SESSION['expiration'] = $expiration;
28  }
29  // Update the password and expiration time every 60 seconds
30  if (time() > $expiration) {
31      $password = generatePassword();
32      $_SESSION['password'] = $password;
33      $expiration = time() + 60;
34      $_SESSION['expiration'] = $expiration;
35  }
36  // Display the password and countdown timer
37  echo "<h2>One-Time Password: $password</h2>";
38  $remainingTime = $expiration - time();
39  echo "<h3>Time remaining: <span id='countdown'>$remainingTime</span> seconds</h3>";
40
41  // Verify the entered password
42  if (isset($_POST['otp'])) {
43      $enteredPassword = $_POST['otp'];
44      if ($enteredPassword === $password) {
45          echo "<script type='text/javascript'> document.location = 'dashboard.php'; </script>";
46      } else {
47          echo "<p>Incorrect password. Please try again.</p>";
48      }
49  }
50 ?>
```

Supportive Research



Implementation of an Authentication System

This research survey is conducted by Mr. S. N. Wijayaratne an undergraduate who is specializing in Cyber Security from Sri Lanka Sri Lanka Institute of Information Technology (SLIIT) and Ms. M. W. N. L. De Silva a

postgraduate in Information System Management from the University of Colombo (UOC). The purpose behind this research is to get your inputs for a new implementation for an Authentication System for a Blockchain-Based Criminal Record Management System.

Please show support by taking a few minutes of your valuable time to fill out this Google Form.

If these are any questions that you would like to clarify about this research survey, please feel free to contact me;

- Email: seneshw@gmail.com / it20171438@my.sliit.lk
- Mobile: +94777207753

**** This research survey will stop collecting responses on the 30th of June 2023 ****

102 responses

[View in Sheets](#)

Not accepting responses



Feedbacks from Beta Test

Thank you for participating in our Authentication System Feedback Survey. Your valuable insights and feedback will play a crucial role in enhancing the functionality, usability, and overall user experience of our newly developed authentication system.

Purpose of the Survey: I have recently launched a new authentication system with the goal of providing a secure and user-friendly way to access our services. We value your opinion and aim to ensure that the system meets your needs and expectations. Your feedback will help us identify areas for improvement, refine existing features, and address any challenges that you may have encountered.

Survey Instructions: Please take a few moments to provide us with your feedback and comments on your experience using the authentication system. Your responses will remain confidential, and your participation is entirely voluntary.

If these are any questions that you would like to clarify about this research survey, please feel free to contact me;

- Email: seneshw@gmail.com / it20171438@my.sliit.lk
- Mobile: +94777207753

30 responses

[View in Sheets](#)

Not accepting responses

Supportive Research [Implementation]

Expertise in Technology

1: Rookie, 10: Expert

30

Familiarity with Facial Recognition

1: Rookie, 10: Expert

Expertise in Technology

Familiarity with Facial Recognition

Comfortability with Facial Recognition

1: Not Comfortable, 10: Highly Comfortable

20

10

0

1

2

3

4

5

6

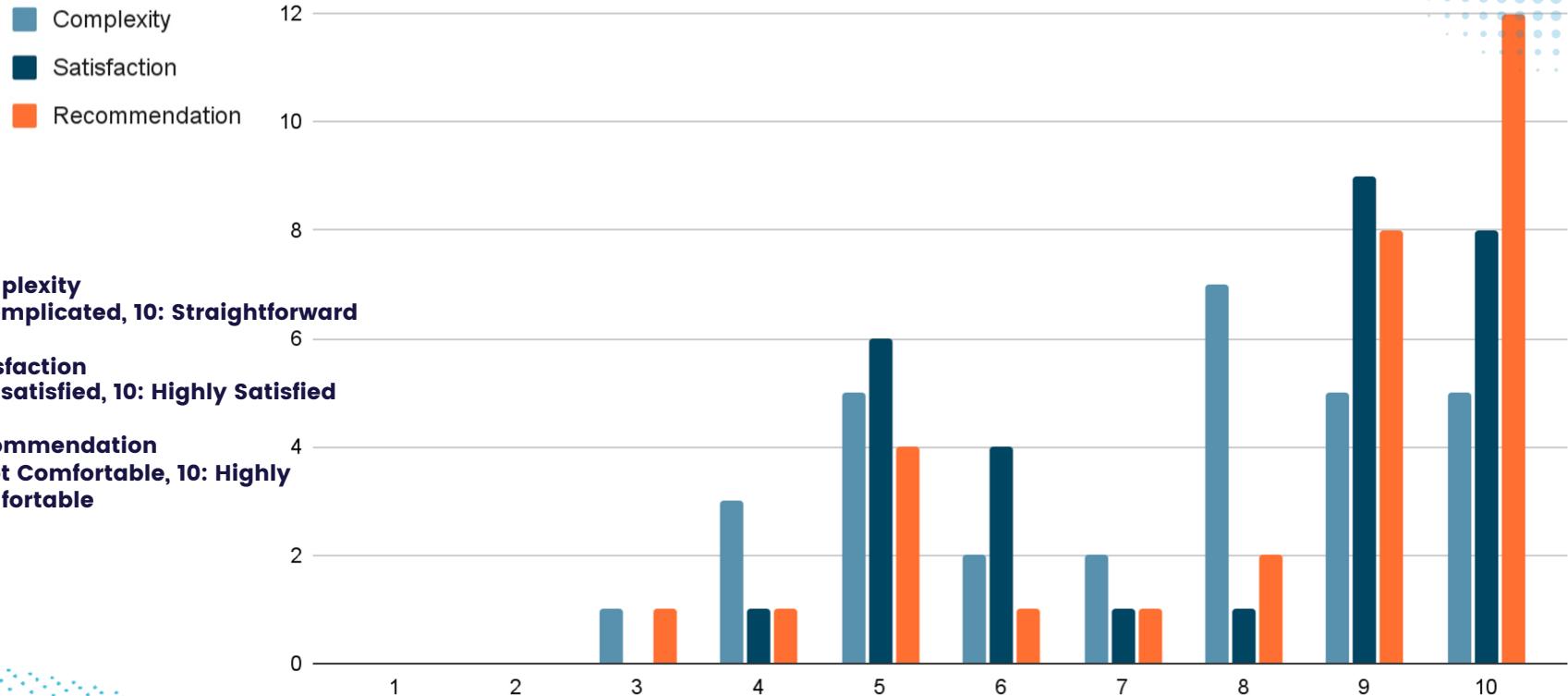
7

8

9

10

Supportive Research [Beta Test]



Complexity

1: Complicated, 10: Straightforward

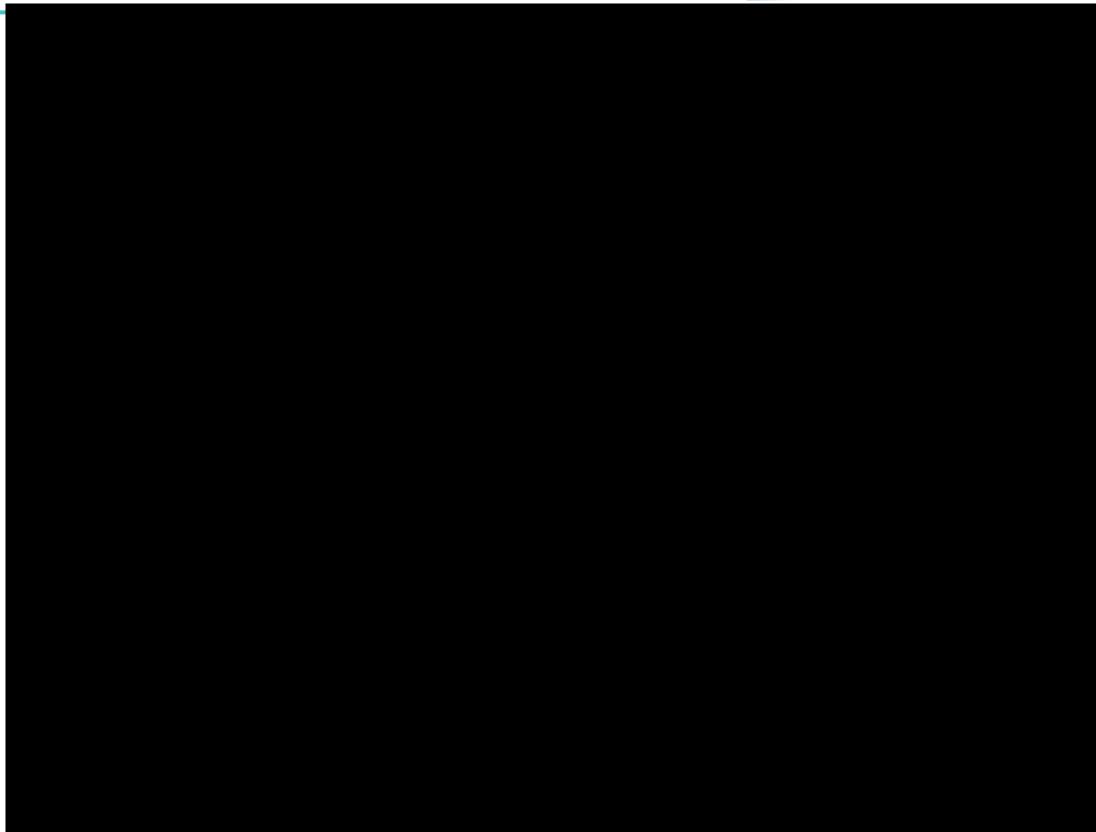
Satisfaction

1: Unsatisfied, 10: Highly Satisfied

Recommendation

1: Not Comfortable, 10: Highly
Comfortable

Demonstration



GitLab Updates

A screenshot of a GitLab user profile for Senesh Wijayarathne. The profile includes a circular profile picture of a person standing in front of a colorful wall of cubes, a bio (@it20171438 · Member since May 14, 2023), and a navigation bar with links to Overview, Activity, Groups, Contributed projects, Personal projects, Starred projects, and Snippets. Below the navigation is a heatmap showing activity over time (Sep to Sep) and day of the week (M, W, F). The heatmap uses a color scale from light gray to dark blue to represent the number of commits. A legend at the bottom indicates the activity types: Issues, merge requests, pushes, and comments.

Senesh Wijayarathne

@it20171438 · Member since May 14, 2023

Overview Activity Groups Contributed projects Personal projects Starred projects Snippets

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
M									■	■	■	■	■
W										■	■	■	■
F									■	■	■	■	■

Issues, merge requests, pushes, and comments.

Pending Work



Dissertation
Report Completion



System
Integrations



Dissertation
Proofreading



Final System
Check



Additional Layer

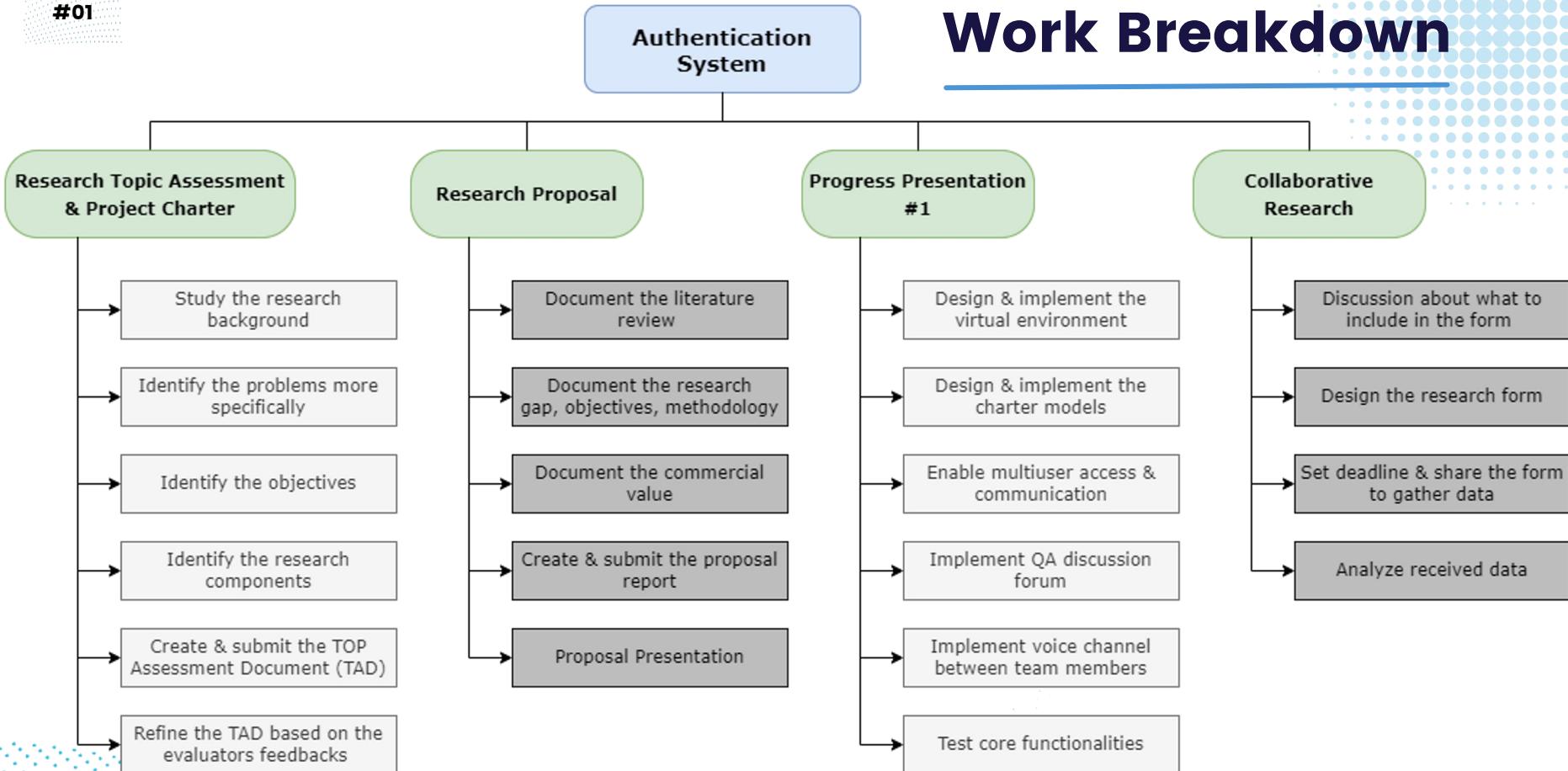


Final Presentation

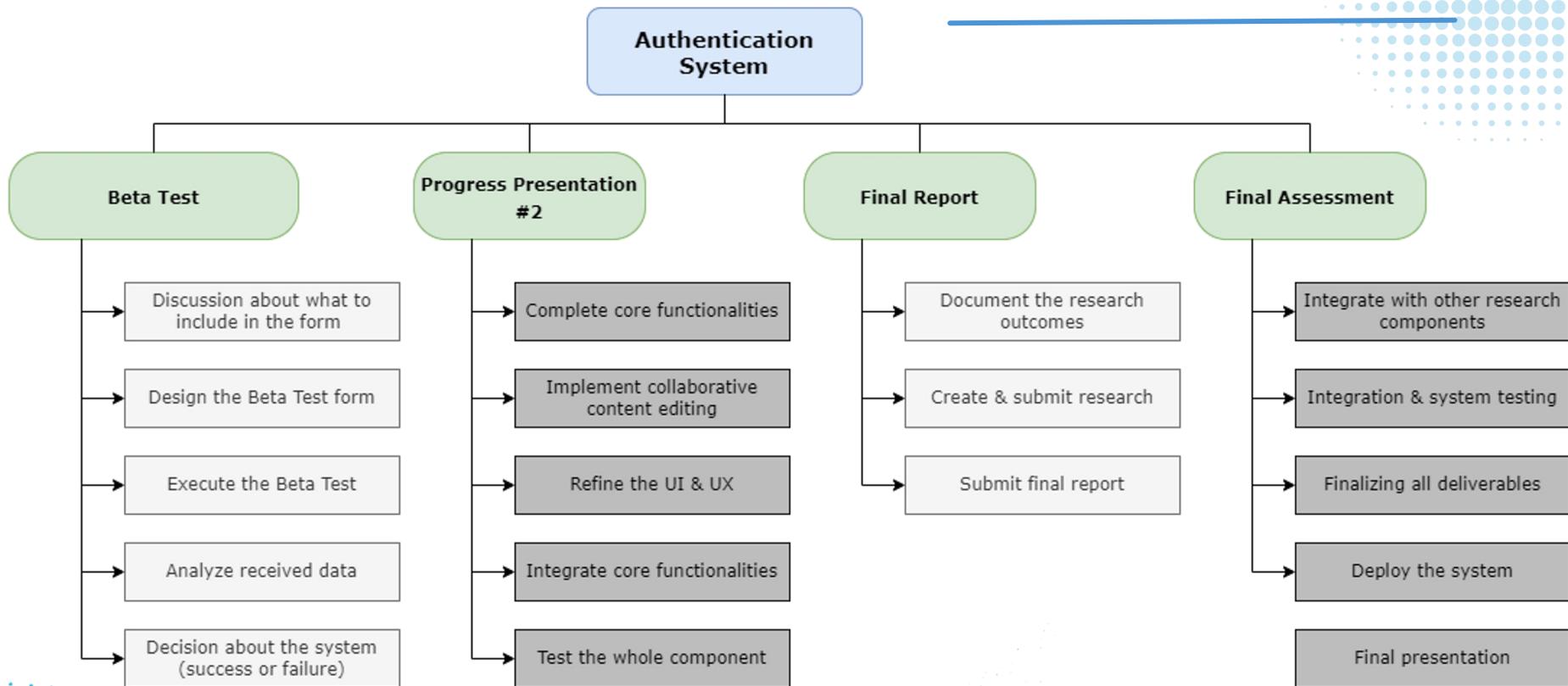
Gantt Chart: It20171438

Gantt Chart

Work Breakdown



Work Breakdown



Upcoming Schedule

Month: September

	M	T	W	T	F	S	S	
Week 1		28	29	30	31	01	02	03
	PROGRESS PRESENTATION II PREPARATION							
Week 2		04	05	06	07	08	09	10
	PROGRESS PRESENTATION II				INTEGRATE			
Week 3		11	12	13	14	15	16	17
	MODULES		FINAL SYSTEM TESTING					
Week 4		18	19	20	21	22	23	24
	FINAL REPORT GENERATION							
Week 5		25	26	27	28	29	30	01
	FINAL REPORT GENERATION							

Upcoming Schedule

Month: October

	M	T	W	T	F	S	S	
Week 1		02	03	04	05	06	07	08
	REPORT SHARED FOR PROOFREADING							
Week 2		09	10	11	12	13	14	15
	FINAL PRESENTATION CREATING							
Week 3		16	17	18	19	20	21	22
	FINAL PRESENTATION PREPARATION							
Week 4		23	24	25	26	27	28	29
	FINAL PRESENTATION							
Week 5		30	31	01	02	03	04	05
	& VIVA							

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04

Secure File Management System



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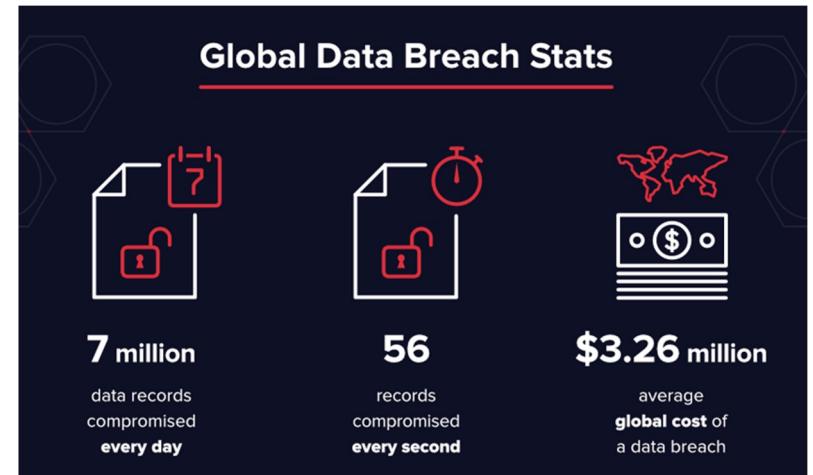
Sub Objective

- Secure File Management System in Decentralized Network
 - Implementing cryptography secure file management system to share file.
 - Implementing cryptography secure file management system to store file.



Research Problem

- Manual file sharing system
 - Paper based
 - Store files in cupboard and etc
- Centralize System
 - Sorting files in a single database without proper encryption
- Data Breach
- Vulnerabilities in Current file management system
 - SQL Injection Attack
 - DDoS Attack
 - Theft / Stolen of the Files

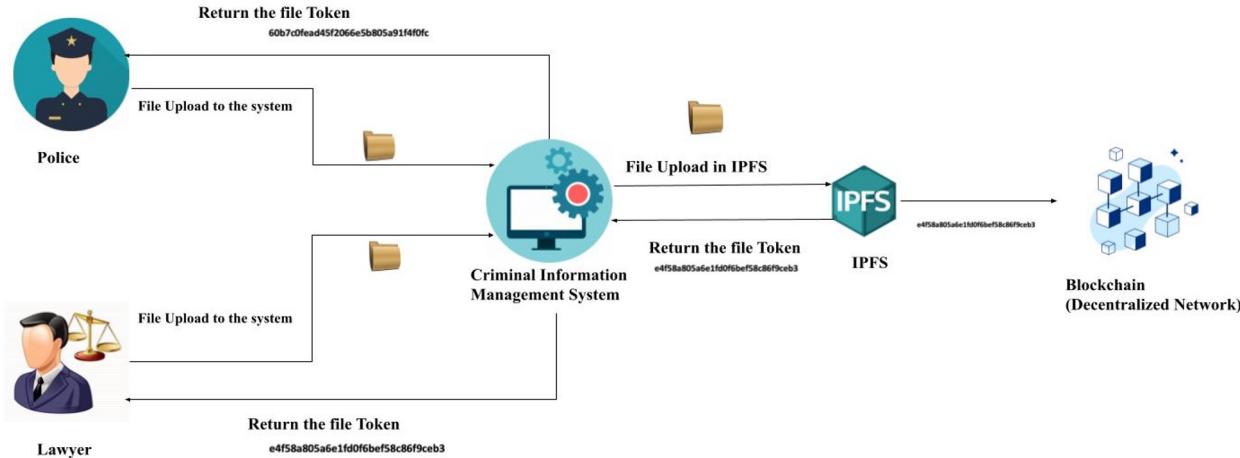


Objective Achieved

- To provide secure storage platform for criminal information management system.
- Ensure Confidentiality, Integrity, Availability.
- Increase the performance and usability of criminal Records.
- Implementing cryptography secure file management system to share file.
- Implementing cryptography secure file management system to store file.

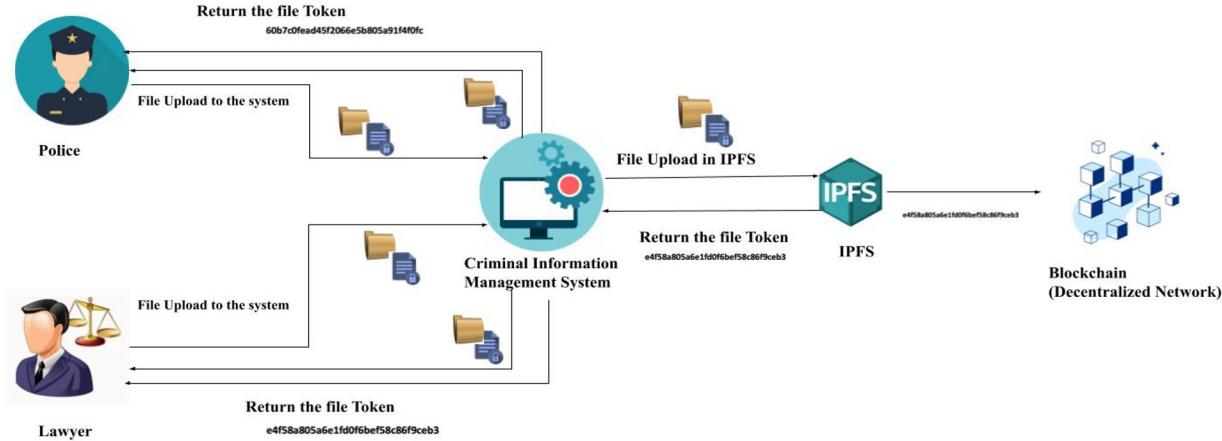
System Diagram

- Secure File Management System in Decentralized Network



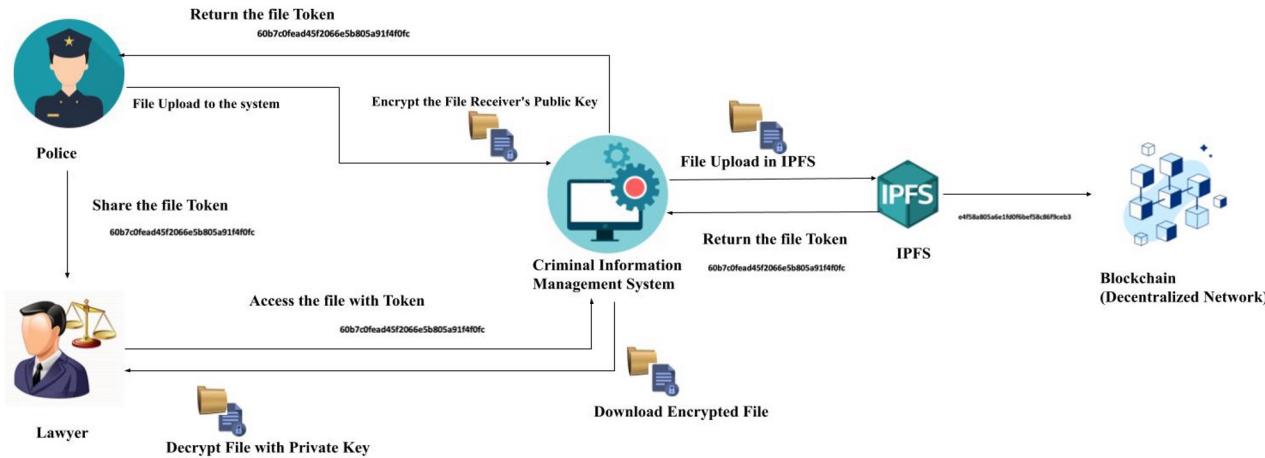
System Diagram

- Implementing Cryptography Secure File Management System to Store File



System Diagram

- Implementing Cryptography Secure File Management System to Share File



Progress up to Progress presentation – 01

- File Upload to IPFS

The screenshot shows a terminal window with the following output:

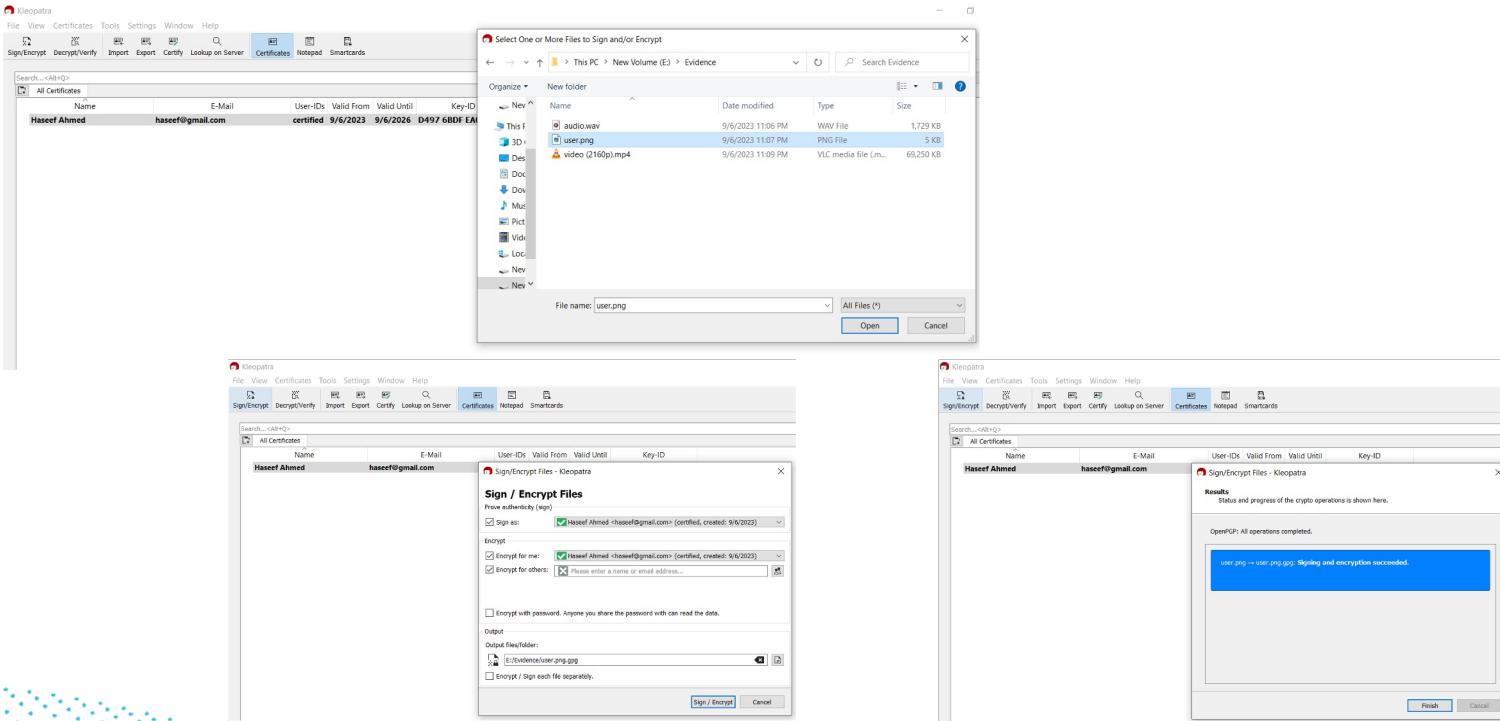
```
PS E:\SECURE FILE MANAGEMENT> node app.js
Saved: 21
{
  path: 'QmY3qW7sX45S8LJh2vdByjmb8SVJKY2Mt2MV1Ut2iVe9Vt',
  cid: CID(QmY3qW7sX45S8LJh2vdByjmb8SVJKY2Mt2MV1Ut2iVe9Vt),
  size: 29
}
```

The terminal output is highlighted with a red rounded rectangle.

Below the terminal, a browser window displays the IPFS URL: <https://ipfs.io/ipfs/QmY3qW7sX45S8LJh2vdByjmb8SVJKY2Mt2MV1Ut2iVe9Vt>. The page content is "Hi it is me Haseef :)".

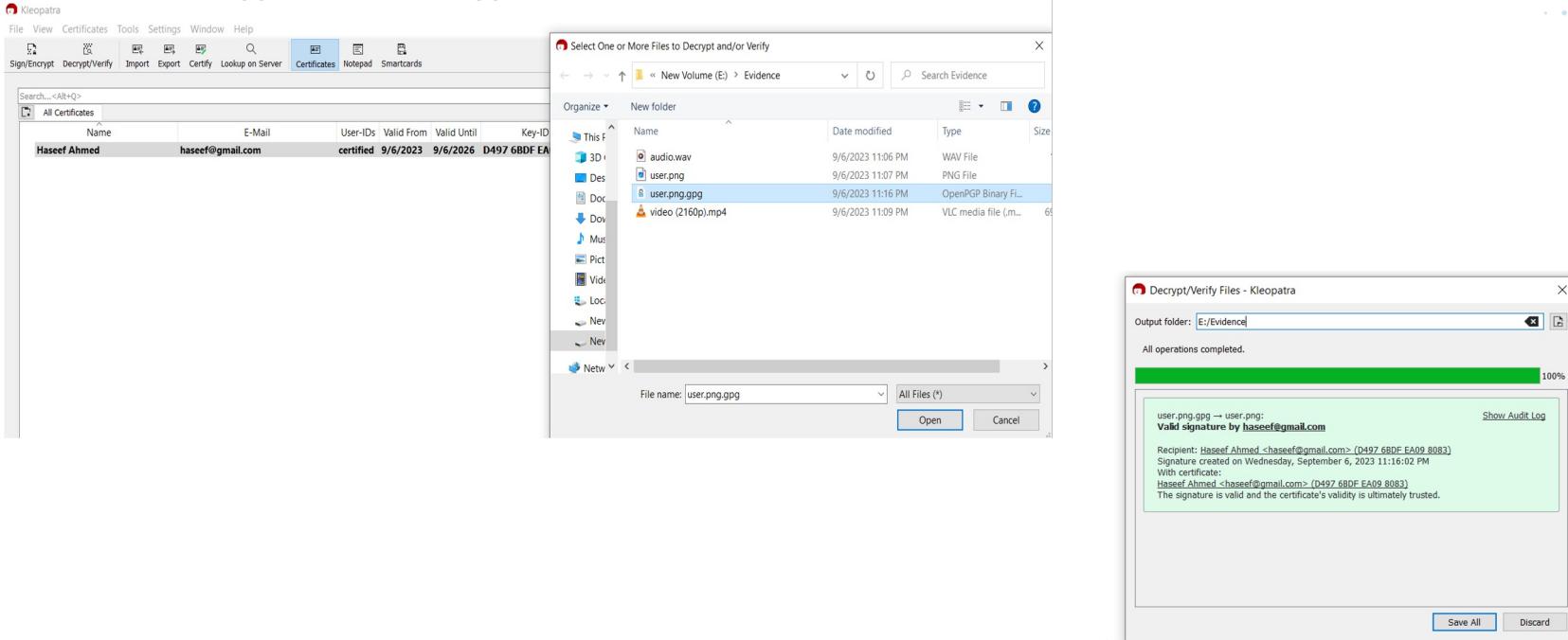
Progress up to Progress presentation – 02

- Encryption & Decryption of the file



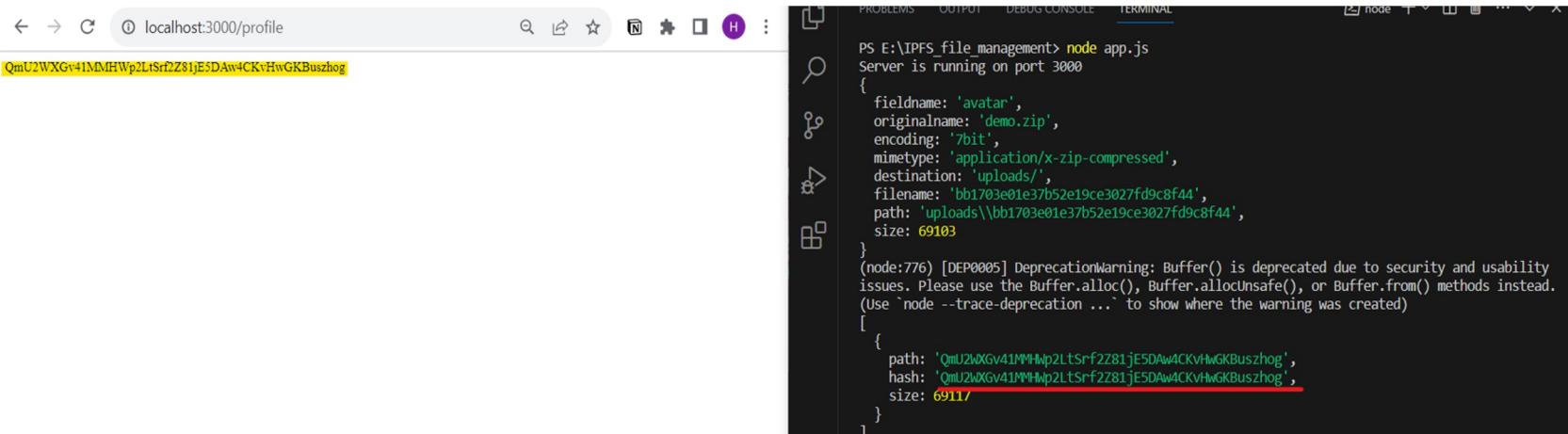
Progress up to Progress presentation – 02

- Encryption & Decryption of the file



Progress up to Progress presentation – 02

- Integrate frontend with IPFS
- File Upload to IPFS

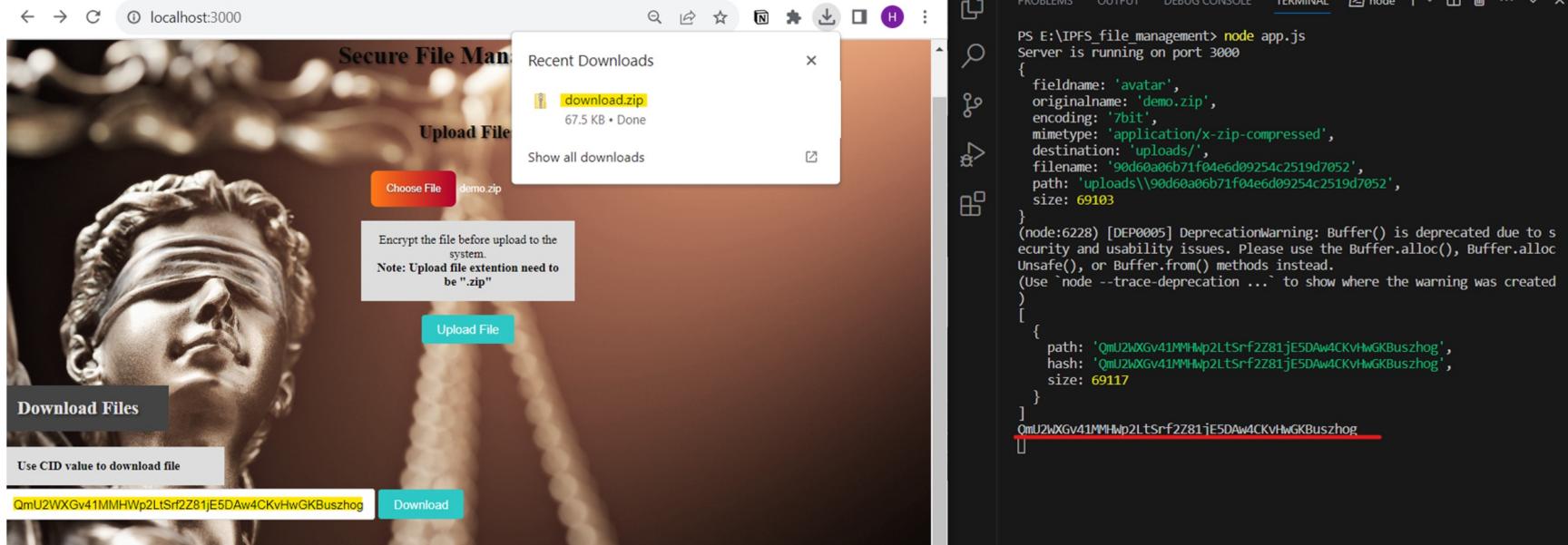


The screenshot shows a browser window at `localhost:3000/profile` with a yellow progress bar indicating file upload progress. Below the browser is a terminal window with the following output:

```
PS E:\IPFS_file_management> node app.js
Server is running on port 3000
{
  filename: 'avatar',
  originalname: 'demo.zip',
  encoding: '7bit',
  mimetype: 'application/x-zip-compressed',
  destination: 'uploads/',
  filename: 'bb1703e01e37b52e19ce3027fd9c8f44',
  path: 'uploads\\bb1703e01e37b52e19ce3027fd9c8f44',
  size: 69103
}
(node:776) [DEP0005] DeprecationWarning: Buffer() is deprecated due to security and usability issues. Please use the Buffer.alloc(), Buffer.allocUnsafe(), or Buffer.from() methods instead.
(Use `node --trace-deprecation ...` to show where the warning was created)
[
  {
    path: 'QmU2WXGv41MMHWp2Lsrf2Z81jE5DAw4CKvHwGKBuszhog',
    hash: 'QmU2WXGv41MMHWp2Lsrf2Z81jE5DAw4CKvHwGKBuszhog',
    size: 69117
]
1
```

Progress up to Progress presentation – 02

- File Download from IPFS



Progress up to Progress presentation – 02

- File Integrity Check
 - Uploaded File Hash

```
PS E:\> Get-FileHash ".\demo.zip"
Algorithm      Hash                               Path
-----      -----                               -----
SHA256        589B727464E5C3069522A362E8CDD53E8268F955A5A11C08A79AC4D13D94D330  E:\demo.zip
```

- Download File Hash

```
PS C:\Users\spt\Downloads> Get-FileHash ".\download.zip"
Algorithm      Hash                               Path
-----      -----                               -----
SHA256        589B727464E5C3069522A362E8CDD53E8268F955A5A11C08A79AC4D13D94D330  C:\Users\spt\Downloads\downlo...
```

Progress up to Progress presentation – 02

- Sending CID value to Blockchain

The image displays two screenshots of a software application titled "CRISYS".

Screenshot 1: Add Records

This screen shows a form for entering crime record details:

- Name: kamal
- Age: 30
- Crime: Murder
- Nic No: 200016902050
- Police Station: maradhana
- Evidence Collected: CCTV Footage
- Evidence ID: QmU2WXGv41MMHWp2l5rf2Z8lJESDAw4CKvhrGKbzschog (highlighted in blue)
- Crime Date: 09/07/2023
- Crime Time: 10:00 AM
- Police Officer: Officer Nimal
- CrimeCount: 3

Screenshot 2: View Records

This screen shows a table of crime records:

Name	Age	Crime	NicNo	PoliceStation	Evidence Collected	Evidence ID	CrimeDate	CrimeTime	PoliceOfficer	CrimeCount
kamal	30	Murder	200016902050	maradhana	CCTV Footage	QmU2WXGv41MMHWp2l5rf2Z8lJESDAw4CKvhrGKbzschog	2023-09-07	10:00	Officer Nimal	3

Background Image

A large, semi-transparent watermark of a police badge is visible in the background. The badge is silver with a blue center, featuring the word "POLICE" at the top, "BICENTENNIAL" in the middle, and the year "1808 46" at the bottom.

Methodology

- IDE : VS Code
- Programming Language: JavaScript, HTML, CSS
- File Management: InterPlanetary File System (IPFS)
- Blockchain Platform: Ganache Personal Blockchain (Truffle Suite)
- Project Management : Trello, Ms Planner
- Encryption & Decryption : Klopatra (GnuPG)

Pending Work



Dissertation
Report Completion



System
Integrations



Dissertation
Proofreading



Final System
Check

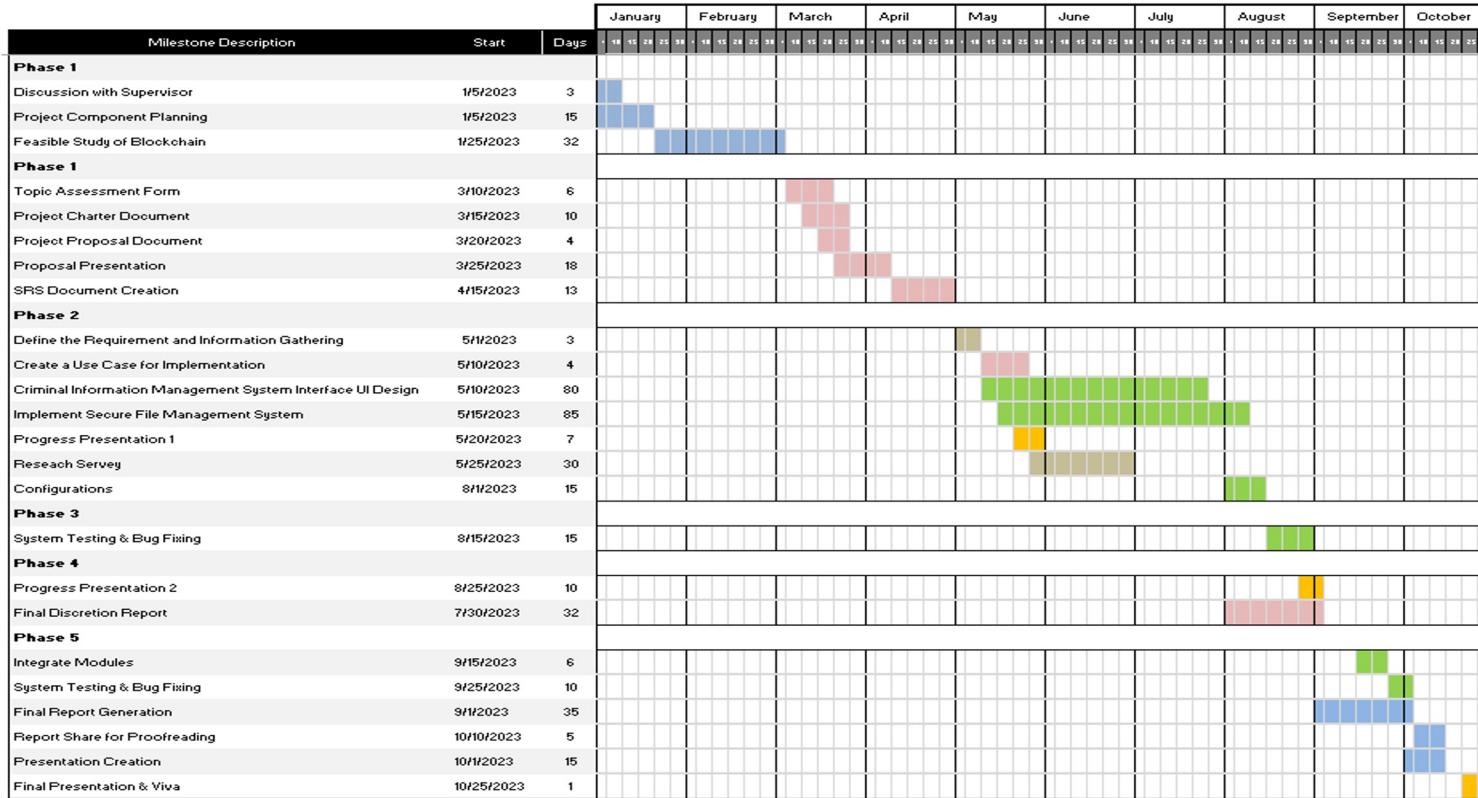


System Website



Final Presentation

Gantt Chart



Upcoming Schedule

Month: September

	M	T	W	T	F	S	S	
Week 1		28	29	30	31	01	02	03
	PROGRESS PRESENTATION II PREPARATION							
Week 2		04	05	06	07	08	09	10
	PROGRESS PRESENTATION II				INTEGRATE			
Week 3		11	12	13	14	15	16	17
	MODULES		FINAL SYSTEM TESTING					
Week 4		18	19	20	21	22	23	24
	FINAL REPORT GENERATION							
Week 5		25	26	27	28	29	30	01
	FINAL REPORT GENERATION							

Upcoming Schedule

Month: October

	M	T	W	T	F	S	S	
Week 1		02	03	04	05	06	07	08
	REPORT SHARED FOR PROOFREADING							
Week 2		09	10	11	12	13	14	15
	FINAL PRESENTATION CREATING							
Week 3		16	17	18	19	20	21	22
	FINAL PRESENTATION PREPARATION							
Week 4		23	24	25	26	27	28	29
	FINAL PRESENTATION							
Week 5		30	31	01	02	03	04	05
	& VIVA							

References

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Demonstration



05

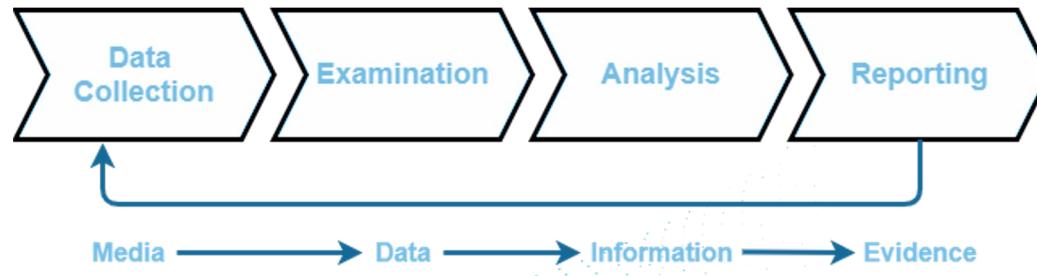
Implementing Chain Of Custody Evidence Management



IT19983370 | THUSHITHARAN .M
Specializing in Cyber Security

Chain of Custody

- Chain of Custody of more than a system, This is a **Process** of handling the movement of evidences by the Department of Police Sri Lanka
- How can the implementation of chain of custody in of the criminal records management improve the current Process of handling the evidence?
 - ❖ Chain of custody is a logical sequence of keep the records of digital evidence process.
 - ❖ Once peer uploads the file, the file is stored in a ipfs.
 - ❖ These block gets appended to the current blockchain, which makes it impossible to edit or delete the file/block.



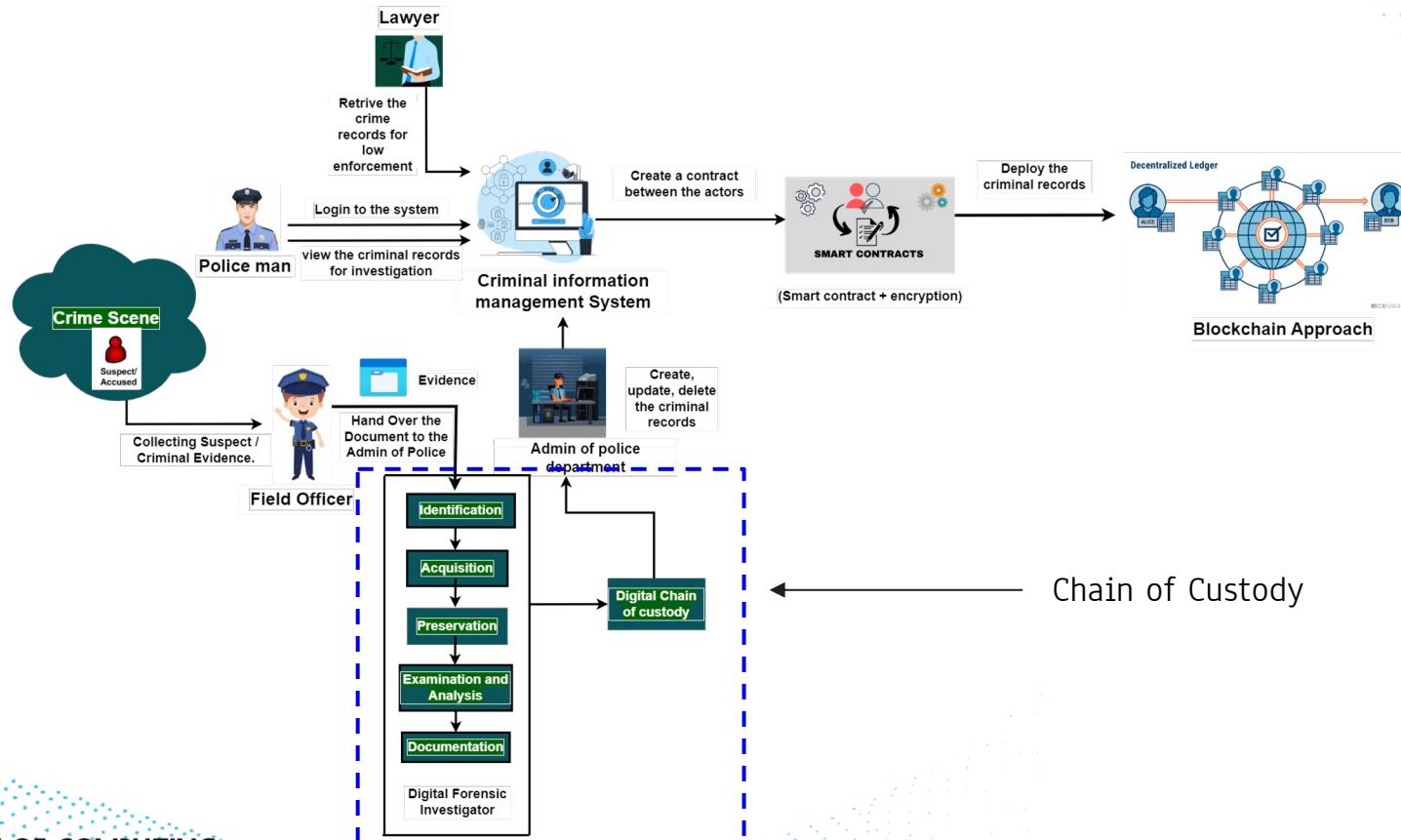
Current System Followed by Sri Lankan Police Department – The Research Problem

- Evidence are not stored in a proper manner.
- Digital evidences are stored locally in the police station computer's hard drive which is completely insecure.
- Any authorized officials can access the digital evidence by just signing in the log ledger. This may let them delete other's evidence without their concern and there will be no records of who deleted the evidence file.
- Not aware of the Chain of Custody process.
- Lack of knowledge in digitalize the physical evidence.

Objective Achieved

- Storing the Evidences details in the database.
- Ensure Confidentiality, Integrity (By checking Hashes of the downloaded file), Availability (always available to download once the user got logged in to the system)
- Increased efficiency, availability.

Chain of Custody Process Diagram



Progress up to Progress presentation – 01

- Before the File Upload

localhost:9000

CRISYS Check-in Uploaded Evidances

Upload an Evidence Uploaded Evidances

User Name:
Enter Your Name

Case ID:
Enter Case ID

Upload an Evidence: No file chosen

Progress up to Progress presentation – 02

- After the File Upload

The screenshot shows a web interface for uploading evidence. On the left, there's a form titled "Upload an Evidence" with fields for "User Name" (placeholder "Enter Your Name") and "Case ID" (placeholder "Enter Case ID"). Below these is a file upload field labeled "Upload an Evidence:" with a "Choose File" button and a message "No file chosen". A "Upload" button is also present. On the right, there's a section titled "Uploaded Evidances" containing three entries:

- Thushi: A red circle with a white letter "T". Next to it is the name "Thushi" and a file entry "1.iml→Download".
- John: A red circle with a white letter "J". Next to it is the name "John" and a file entry "5.docx→Download".
- user: A red circle with a white letter "u". Next to it is the name "user" and a file entry "3.pdf→Download".

Progress up to Progress presentation – 02

- Implement Evidence Movement Log Management System(upload)

44	Sep 06, 2023 10:04	admin	Logged in the system.
45	Sep 06, 2023 13:25	admin	added [id=9] Abi Lash into the member list.
46	Sep 06, 2023 22:02	admin	Logged out.
47	Sep 06, 2023 22:02	thushi	Logged in the system.
48	Sep 06, 2023 22:38	thushi	Logged out.
49	Sep 06, 2023 22:38	admin	Logged in the system.
50	Sep 06, 2023 22:48	admin	Logged out.
51	Sep 06, 2023 22:48	perera	Logged in the system.
52	Sep 06, 2023 22:58	perera	added [id=10] Sadun Perera into the member list.
53	Sep 06, 2023 23:12	perera	perera uploaded 'Melissa Beach' for case 'Quo sunt vel consequ'
54	Sep 06, 2023 23:15	perera	Uploaded 'James Keller' for case 'Laborum odit exceptu'
55	Sep 06, 2023 23:18	perera	Uploaded 'uploads/sample.jpg' for case 'Voluptatem tenetur e'
56	Sep 06, 2023 23:19	perera	Uploaded 'uploads/sample.jpg' for case '1776'
57	Sep 07, 2023 00:20	perera	Uploaded 'uploads/SLIIT.png' for case '1999'

Progress up to Progress presentation – 02

- Implement Criminal Records Entry Log Management System

The screenshot shows a web-based application interface for managing criminal records. At the top, there is a navigation bar with links for Home, Event Logs, View Evidences, Add Evidences, and Users. A user profile is also visible on the right. Below the navigation bar, the main content area has a title "Criminal List". A table displays a list of individuals with columns for #, First Name, Last Name, Contact #, and Address. Each row in the table includes an "Action" dropdown menu. A modal window titled "New Member" is open in the center, containing fields for First Name, Last Name, Contact #, and Address, along with "Save" and "Close" buttons.

#	First Name	Last Name	Contact #	Address	Action
1	Abi	Lash			Action ▾
2	Abithasan	Manoranjan			Action ▾
3	Clairy	Blake			Action ▾
4	John	Cena			Action ▾
5	Mikee	Williams			Action ▾
6	Sadun	Perera			Action ▾
7	Thushি	Sutha			Action ▾

Overall Pending Work



Sub Component
Integration within
my component



Overall System
Integrations



Dissertation
Proofreading



Final System
Check



System Website



Final Presentation

Methodology

- IDE : Visual Studio Code
- Programming Language: HTML, CSS, Javascript, Php, Mysql
- Server: Apache web Server
- Project Management : Trello, MS Planner
- Version Control: Gitlab

Pending Development

- Implement Download log storing Functionality
- Evidence Log Filtering Functionality
- Common UI Integration
- Defining and Implementing Admin Level Access
- Status of the evidence needs to be stored (Processing/Completed/Submitted to the court)
- Overall Component Integration
 - *Senesh Component - To check the current logged in user(staff) details*
 - *Branavan Component - To store the criminal record logs*
 - *Haseef Component - To store download/upload logs*

Progress Flow

Research on CoC

Despite being red, mars is actually a cold place



Planning

Plan what are the functionalities needs to be implemented to complete the component

Phase 1: Development

- Developed basic Chain of Custody System(to upload the evidence)

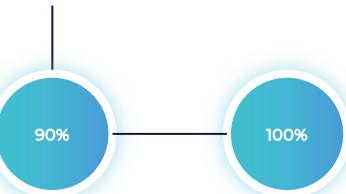


Phase 2: Development

- Development of the log management system
- the logs database should contain the log details of upload/download evidence, criminal records entry logs, system user activity logs

Phase 3: Development

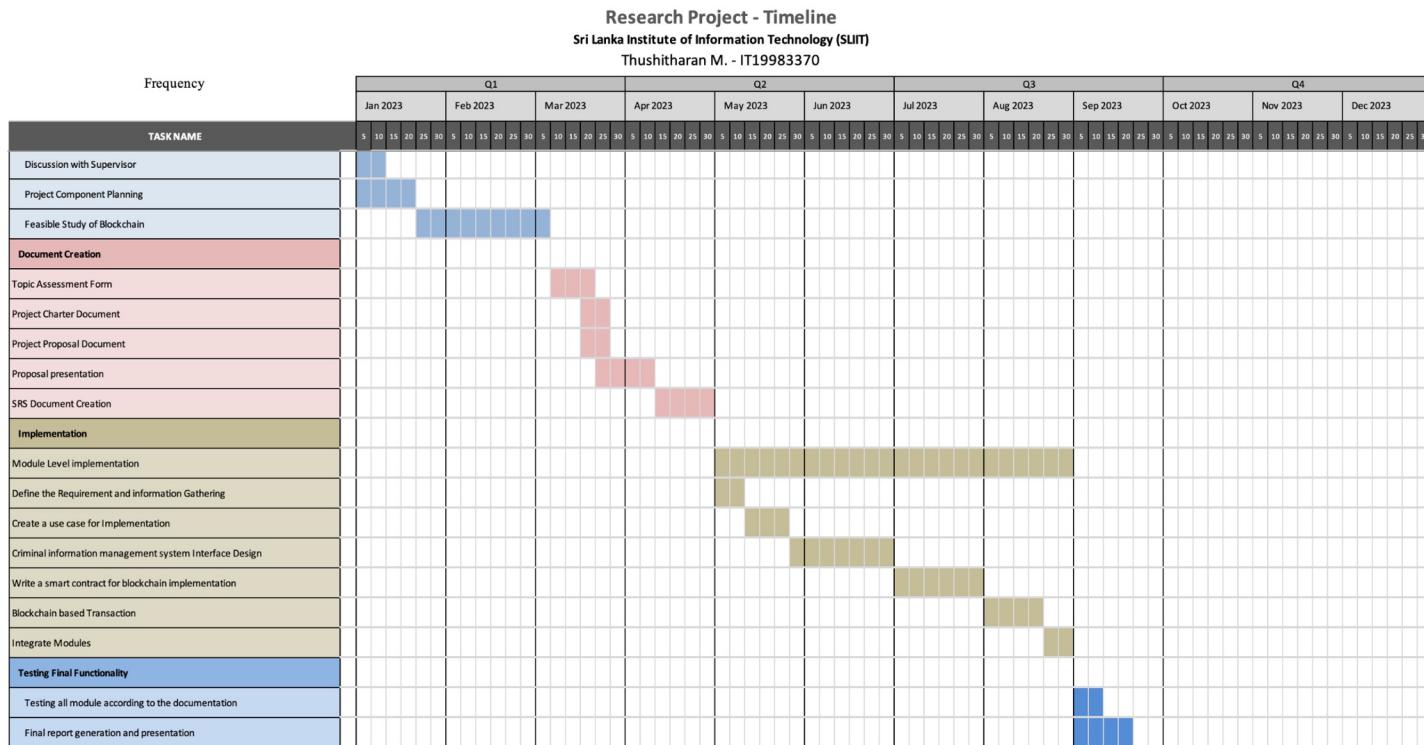
- This phase contains the minor functionalities as follows: filtering the evidences,



Launch the Final Product

- User Training
- Getting feedbacks
- Bux Bixes

Gantt Chart



Upcoming Schedule

Month: September

	M	T	W	T	F	S	S
Week 1	28	29	30	31	01	02	03
	PROGRESS PRESENTATION II PREPARATION						
Week 2	04	05	06	07	08	09	10
	Progress Presentation II				Checking		
Week 3	11	12	13	14	15	16	17
	Input Validations			Integration within my Component			
Week 4	18	19	20	21	22	23	24
	Whole System Integration						
Week 5	25	26	27	28	29	30	01
	Whole System Integration						

Upcoming Schedule

Month: October

	M	T	W	T	F	S	S
Week 1	02	03	04	05	06	07	08
	Report Shared for Proofreading						
Week 2	09	10	11	12	13	14	15
	Testing the final Product and Bux Fixes						
Week 3	16	17	18	19	20	21	22
	Final Presentation Preparation						
Week 4	23	24	25	26	27	28	29
	Final Presentation Preparation				Final Presentation		
Week 5	30	31	01	02	03	04	05
	& VIVA						

References

1. Prayudi, Yudi & Sn, Azhari. (2015). Digital Chain of Custody: State of The Art. International Journal of Computer Applications. 114. 975-8887. 10.5120/19971-1856..
1. Anderson, G.S., Litzenberger, R. and Plecas, D. (2002), "Physical evidence of police officer stress", Policing: An International Journal, Vol. 25 No. 2, pp. 399-420.
1. Tasnim, Maisha & Omar, Abdullah & Rahman, Shahriar & Bhuiyan, Md. (2018). CRAB: Blockchain Based Criminal Record Management System. 294-303. 10.1007/978-3-030-05345-1_25.

Supervisor & Co-Supervisor



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Supervisor



Ms. Dinithi Pandithage
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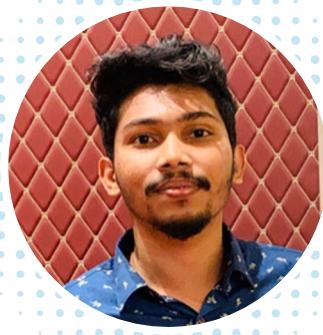
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THANK YOU!

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