
SEC-HEALTH A BLOCK CHAIN BASED PROTOCOL FOR SECURING HEALTH RECORDS

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ABSTRACT

Storing and sharing health records through electronic systems pose security risks. To address them, several countries' regulations have established that healthcare information systems must fulfill security properties (confidentiality, access control, integrity, revocation and anonymity) and complementary ones (emergency access and interoperability). Upon tackling these issues, several proposals present security limitations and/or address specific properties only. We propose Sec-Health, a blockchain-based protocol that secures health records, addressing all of the main security and complementary properties defined in current regulations. We show that Sec-Health is a suitable solution by analyzing it under several attack scenarios and describing how it overcomes the problems of existing solutions. Furthermore, we evaluate a Sec-Health Proof of Concept, showing that it can reduce from 26% up to 90% the time to access health records, and reduce up to 50% client-side memory overhead, compared to related work.

1 INTRODUCTION

Information technologies introduce a number of resources and benefits to the healthcare field. Electronic Health Records (EHRs), such as patient's medical history, are one of the most widely employed resources providing a wide view of a patient's medical status. EHRs are commonly originated and shared with collaborators (e.g., physicians, nurses) through cloud computing systems, which results in a more convenient approach to managing such records. Cloud-based systems, however, introduce security challenges in healthcare . A recent report shows that healthcare data breaches are highly common , wherein several of them are classed as unauthorized access, which may lead to inappropriate use of health records (e.g., unwanted advertisements or lower chances of conquering a job opportunity).

Literature Survey

Because health records are targeted by cybercriminals, several countries established regulations requiring any entity to employ security measures when handling health data. The Health Insurance

Portability and Accountability Act (HIPAA), enacted by the United States Congress in 1996, provides guidelines that must be observed by all national healthcare organizations (e.g., hospitals). In 2016, the European Union has approved the General Data Protection Regulation (GDPR), recognizing that health records need special limitations regarding access and treatment through appropriate security mechanisms. Inspired by the GDPR, Brazil's government enacted the General Law for Personal Data Protection (LGPD) that presents similar principles

3 IMPLEMENTATION STUDY

EXISTING SYSTEM:

The literature presents several proposals that aim to ensure health records security. However, there is a lack of proposals that approach the main health records properties. Instead, they address only a subset of the concerns. In general, these solutions employ centralized approaches (e.g., based on clouds) or decentralized ones (e.g., blockchain-based).

Disadvantages:

- There is no MECHANISMS FOR ACCESS REVOCATION AND INTEROPERABILITY system which is not in an existing system.
- There is no health records protection against unauthorized modification and deletion.

Proposed System & algorithm

The system proposed Sec-Health, a protocol that secures health records by addressing all of their properties. In essence, Sec-Health is composed of a set of schemes, based on decentralized approaches (e.g., blockchain and InterPlanetary File System and cryptographic primitives (e.g., Ciphertext-Policy Attribute-based Encryption and public key encryption), which allow records to be stored and shared securely.

4.1 Advantages:

- (i) a blockchain-based protocol (Sec-Health), based on our previous work, which enhances the schemes employed in the previous protocol to fulfill the security properties of confidentiality, access control, and integrity;
- (ii) (ii) Sec-Health includes novel schemes to address additional properties, i.e., emergency access, access revocation, anonymity, and interoperability;

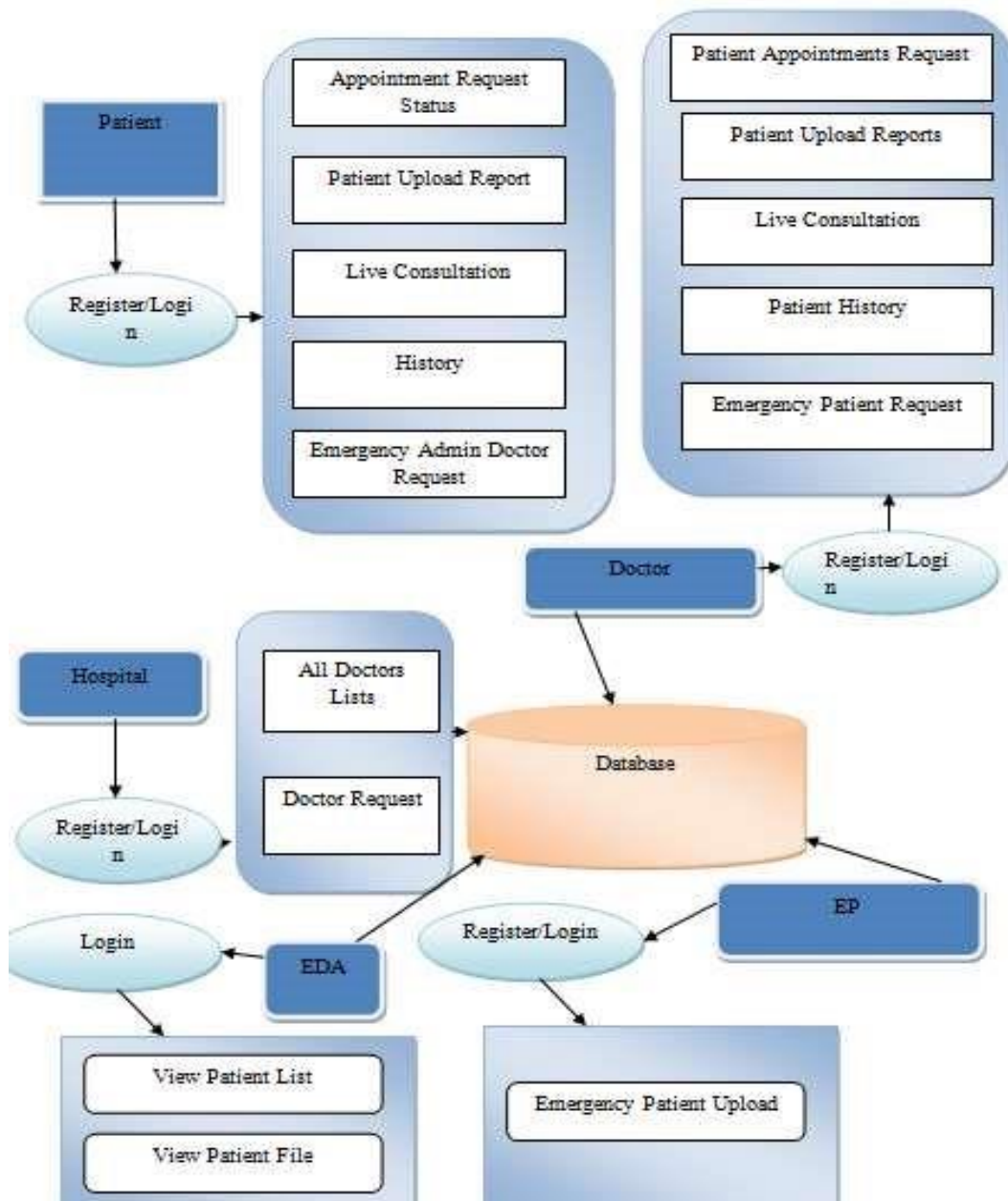


Fig:3.1 System Architecture

IMPLEMENTATION

Modules

Admin

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, List all users and authorize, View All Datasets, Decrypt & View All Health Records Type By Block chain, View Healthcare Records Type Results, View Diets Records Type Results.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like Register and Login, View Profile, Upload Datasets, Find Healthcare Record Type, Find Healthcare Record Type By Hash code,

5 RESULTS AND DISCUSSION

Screen Shots



Fig 5.2 admin page



Fig 5.3 registration page



Fig 5.4 searching



Fig 5.5 Slide 1

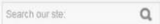
Fig 5.6 slide2

Fig 5.6 slide 3

Fig 5.7 user

Sec Health A Blockchain Based Protocol for Securing Health Records

← → ↻ 🔍 localhost:9090/Sec-Health%20A%20Blockchain-Based%20Protocol%20for%20Securing%20Health%20Records/U_Register.jsp



Register Now

User Register Status...

(*) Required

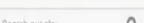
User Name *	<input type="text" value="tmksmanju"/>
Password *	<input type="password" value="*****"/>
Email-Id *	<input type="text" value="tmksmanju14@gmail.com"/>
Mobile Number *	<input type="text" value="9"/>
Your Address *	<input type="text"/>
Select Gender *	--Select--
Your Location *	<input type="text"/>
Date of Birth *	<input type="text"/>
Pin Code *	<input type="text"/>
Country *	--Select--
Time Zone *	--Select--
User Language *	--Select--
Select a book *	--Select--


Sidebar Menu

- Home
- Server
- User

Sec Health A Blockchain Based Protocol for Securing Health Records

← → X 🔍 localhost:9090/Sec-Health%20A%20Blockchain-Based%20Protocol%20for%20Securing%20Health%20Records/U_Login.jsp





User Login

User Name *

Password *

[New User? Register](#)

[Back](#)

Sidebar Menu

- Home
- Server
- User

View All Datasets By Blockchain x User Main
Sec Health A Blockchain Based Protocol for Securing Health Records
localhost:9090/Sec-Health%20A%20Blockchain-Based%20Protocol%20for%20Securing%20Health%20Records/S_View_All_Datasets_By_Blockchain.jsp

Health Records Type Block Chain-->: Secured
Health Records Type Hash Code -->: 6ae9dc460b49c2aa6337dd9c775109e60c5a4cd

Patient_ID	Age	Sex	Cholesterol	Blood_Pressure	Heart_Rate	Diabetes	Family_History	Smoking	Obesity	Alcohol_Consumption
203.205.179.170-10.42.0.211-80-45697-6	67.0	Male	208.0	158/88	72.0	0.0	1.0	0.0	0.0	
209.10.120.26-10.42.0.211-80-34498-6	84.0	Male	383.0	163/100	73.0	1.0	1.0	0.0	1.0	
10.42.0.211-104.192.110.245-54035-80-6	54.0	Female	297.0	172/86	48.0	1.0	1.0	0.0	1.0	
10.42.0.151-23.194.181.192-45017-443-6	84.0	Male	220.0	131/68	107.0	0.0	1.0	1.0	1.0	
10.42.0.151-10.42.0.1-7610-53-17	43.0	Female	248.0	160/70	55.0	0.0	1.0	1.0	1.0	
10.42.0.42-123.125.29.220-48565-80-6	71.0	Male	374.0	158/71	70.0	1.0	1.0	1.0	1.0	
10.42.0.42-111.206.25.159-46340-80-6	77.0	Male	228.0	101/72	68.0	1.0	1.0	1.0	1.0	
162.208.20.184-10.42.0.151-443-36427-6	60.0	Male	259.0	169/72	85.0	1.0	1.0	0.0	1.0	
182.22.67.88-111.206.25.159-46340-80-6	77.0	Male	228.0	101/72	68.0	1.0	1.0	1.0	1.0	

3:04 / 5:32 Scroll for details

View All Datasets x User Main
Sec Health A Blockchain Based Protocol for Securing Health Records
localhost:9090/Sec-Health%20A%20Blockchain-Based%20Protocol%20for%20Securing%20Health%20Records/S_View_All_Datasets.jsp

View All Datasets !!!

Patient_ID	Age	Sex	Cholesterol	Blood_Pressure	Heart_Rate	Diabetes	Family_History
203.205.179.170-10.42.0.211-80-45697-6	NjcuMA==	TWFsZQ==	MjA4LjA=	MTU4Lzg4	NzluMA==	MC4w	0.0
10.42.0.211-98.139.199.204-52206-443-6	MjEuMA==	TWFsZQ==	Mzg5LjA=	MTY1LkZz	OTg0MA==	MS4w	1.0
10.42.0.42-64.71.142.95-60947-443-6	MjEuMA==	RmVYTWxl	MzI0LjA=	MTc0LkZz	NzluMA==	MS4w	0.0
209.10.120.26-10.42.0.211-80-34498-6	ODQuMA==	TWFsZQ==	Mzg5LjA=	MTYzLzEwMA==	NzluMA==	MS4w	1.0

2:41 / 5:32 Scroll for details

Microsoft Excel screenshot showing a dataset titled "Sec Health A Blockchain Based Protocol for Securing Health Records". The data is organized in columns A through N, with rows 82 through 106 visible. The columns represent various attributes including IP addresses, gender, age, and health status.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
82	10.42.0.211-10.42.0.1-5052-53-17	45	Male	396	108/74	76	1	1	1	1	0	17.88671	Unhealthy	
83	10.42.0.211-106.11.92.16-36114-443-6	39	Male	255	160/70	81	1	0	1	1	1	14.14397	Unhealthy	
84	203.205.158.60-10.42.0.151-60-45902-6	53	Male	209	92/65	96	1	0	1	0	1	12.0983	Average	
85	172.217.7.196-10.42.0.151-443-43600-6	90	Male	247	151/101	101	0	1	1	0	1	14.19505	Average	
86	172.217.6.205-10.42.0.151-443-52225-6	69	Male	250	95/78	75	1	1	1	1	0	7.295877	Average	
87	10.42.0.151-10.42.0.1-39029-53-17	30	Male	227	115/73	40	1	1	1	0	0	15.31726	Average	
88	208.75.88.4-10.42.0.211-123-41183-17	38	Female	246	148/94	58	1	0	0	0	0	16.04866	Unhealthy	
89	182.22.25.252-10.42.0.211-443-38738-6	56	Female	223	100/66	68	1	0	1	0	0	19.62007	Average	
90	10.42.0.151-10.42.0.1-7619-53-17	63	Male	379	163/110	71	1	0	1	0	0	8.296929	Average	
91	180.149.136.194-10.42.0.42-80-49045-6	80	Male	330	122/80	53	0	0	1	0	1	4.514998	Unhealthy	
92	10.42.0.211-123.125.115.164-57970-443-6	60	Male	195	118/91	68	1	1	1	0	1	17.40234	Average	
93	203.205.158.61-10.42.0.151-80-44158-6	69	Female	222	110/104	60	1	0	1	1	1	2.06446	Unhealthy	
94	10.42.0.151-64.71.142.125-36686-443-6	77	Female	194	149/83	77	1	0	1	0	1	0.73363	Unhealthy	
95	172.217.10.35-10.42.0.211-443-52519-6	65	Female	178	134/100	48	0	1	1	0	0	0.841227	Healthy	
96	10.42.0.211-10.42.0.1-5351-43251-17	46	Female	155	116/85	105	1	0	1	0	1	18.41517	Unhealthy	
97	131.253.61.100-10.42.0.211-443-52907-6	83	Male	240	165/79	69	1	0	1	1	1	0.948014	Healthy	
98	198.11.136.24-10.42.0.211-443-33414-6	27	Male	237	102/69	65	1	1	1	1	1	0.758667	Unhealthy	
99	151.101.1.140-10.42.0.211-443-48050-6	31	Female	333	168/107	106	1	0	0	0	0	15.73316	Healthy	
100	10.42.0.151-10.42.0.1-2478-53-17	82	Male	216	160/67	109	1	1	1	1	1	15.58409	Average	
101	8.41.222.241-10.42.0.42-443-39458-6	26	Male	278	92/71	65	1	0	1	1	1	13.11533	Healthy	
102	10.42.0.211-106.39.169.66-55315-80-6	90	Male	224	164/65	98	1	0	1	0	1	3.560949	Average	
103	10.42.0.211-119.146.74.31-42058-443-6	39	Male	326	155/104	47	1	0	1	0	0	12.81565	Average	
104	10.42.0.151-31.13.71.37-33659-443-6	40	Male	198	104/98	59	1	1	1	0	1	15.13117	Average	
105	10.42.0.211-10.42.0.1-23892-53-17	86	Male	301	159/76	51	1	0	1	0	0	1.939739	Average	
106	172.217.11.10-10.42.0.211-443-60994-6	56	Male	314	152/94	51	0	1	1	0	1	11.58589	Average	



Sec Health A Blockchain Based Protocol for Securing Health Records

Find Healthcare Record Type By Hashcode !!!

Patient_ID	Age	Sex	Cholesterol	Blood_Pressure	Heart_Rate	Diabetes	Family_History	Smoking	Obesity	Alcohol_Consumpt
210340502751370	NjcuMA==	TWfsZQ==	MjA4LjA=	MTU4Lzg4	NzIuMA==	MC4w	0.0	1.0	0.0	0.0
10132040305790	ODQuMA==	TWfsZQ==	MzgZLjA=	MTYzLzEwMA==	NzMUMa==	MS4w	1.0	1.0	0.0	1.0
1045023080345	NTQuMA==	RmVtYWxl	Mjk3LjA=	MTcyLzg2	NDguMA==	MS4w	1.0	1.0	0.0	1.0
2300072143152	ODQuMA==	TWfsZQ==	MjIwLjA=	MTMxLzY4	MTA3LjA=	MC4w	0.0	1.0	1.0	1.0
1018258037510	NDMuMA==	RmVtYWxl	MjQ4LjA=	MTYwLzcx	NTUuMA==	MC4w	1.0	1.0	1.0	1.0
1240005030220	NzEuMA==	TWfsZQ==	Mzc0LjA=	MTU4Lzcx	NzAuMA==	MS4w	1.0	1.0	1.0	1.0
1140000030259	NzcuMA==	TWfsZQ==	MjI4LjA=	MTAxLzcy	NjguMA==	MS4w	1.0	1.0	1.0	1.0
116320002306899	NjAuMA==	TWfsZQ==	MjU5LjA=	MTY5Lzcy	ODUuMA==	MS4w	1.0	1.0	0.0	1.0

6. CONCLUSION AND FUTURE WORK

CONCLUSION

In this work, we proposed Sec-Health, a block chain-based protocol that secures health records while addressing all of their main properties, namely confidentiality, access control, integrity, access revocation, emergency access, interoperability, and anonymity. Sec-Health shows security advantages compared to related proposals that present highly centralized mechanisms. While those proposals are generally based on a trusted or semi trusted server, Sec-Health affords several decentralized features, preventing one single entity from compromising the healthcare system. Furthermore, compared to decentralized solutions, our protocol addresses the challenging problem of fulfilling all the main properties of health records, whereas other solutions focus on offering mechanisms for specific properties only.

7. REFERENCES

In this work, we proposed Sec-Health, a block chain-based protocol that secures health records while addressing all of their main properties, namely confidentiality, access control, integrity, access revocation, emergency access, interoperability, and anonymity. Sec-Health shows security advantages compared to related proposals that present highly centralized mechanisms. While those proposals are generally based on a trusted or semi trusted server, Sec-Health affords several decentralized features, preventing one single entity from compromising the healthcare system. Furthermore, compared to decentralized solutions, our protocol addresses the challenging problem of fulfilling all the main properties of health records, whereas other solutions focus on offering mechanisms for specific properties only.