

## A Secure And Efficient Cloud Centric Internet Of Medical Things Enabled Smart Health Care System With Public Verifiability

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### ABSTRACT

*In this paper, we have proposed escrow-free identity-based aggregate sign encryption (EF-IDASC) scheme, which is secured against the existential forgery attack under the chosen message attack (EUF-CMA) and indistinguishable under the chosen cipher text attack (IND-CCA2). On comparing with other schemes, it has the least energy consumption in terms of communication and computation. Based on the proposed EFIDASC, we have implemented a cloud-centric internet of medical things enabled smart healthcare system. The healthcare system has achieved secure patients PHI within BAN, and outside the BAN, and public integrity of PHI stored on the cloud without revealing information to any third entity. Further, we have scrutinized the performance of the proposed cloud-centric IoMT-based health care system in terms of computation energy and communication energy consumption*

**Keywords : Cloud computing, Medical services, Data communication, Encryption, Wireless communication**

### INTRODUCTION

Industrial Internet of things (IIoT) is the prominent fast-growing technology having several smart interconnected devices, which senses, processes, and shares data using sensors embedded everywhere. The IIoT connected medical monitoring devices (e.g., Wireless Body Area Network (WBAN)) have recently become accessible for real-time monitoring of a patient's health remotely. WBAN is the network of various tiny sensors, typically have limited storage, power, and computing capabilities. The sensor is implanted on or inside the patient's body that collects the patient's personal health information (PHI) and transmits it to the medical professional (data consumer) via a wireless (cellular) network. Any attack on a sensor or unauthorized access to a patient's PHI may lead to a life-threatening risk to the patients. Thus, the security and privacy of a patient's PHI over the public network are the major unsolved problems with the challenge arising from the resource constraints behavior. Recently, mobile technology has benefitted the smart healthcare, but day-to-day increasing data transmission over-burden the cellular network. One of the compelling solutions is the Device-to-Device (D2D) communication that may be operated at the same time/frequency resources over short distances.

Recently, cloud-enabled IoT has potentially served the storage and computation capability for massive IoT data. However, the advantages that cloud leverages to IoT come with the cost of other security risks that have never been noticed in the conventional IoT system. In practice, a cloud is an honest-but-curious entity that follows a correct way to compute and store the massive collected data but curious to access the data inappropriately for an adversarial advantage. The cloud provides a user-delegated facility but handles the security of user data

became a challenge. The advantage of having these technologies in the e-health monitoring system is to build a convenient platform that enables an authorized medical entity to diagnose a patient’s disease remotely.

Besides, another essential problem associated with the cloud-enabled medical system is to validate the integrity of the stored data on the cloud. However, public auditing can provide an effective solution to verify the integrity of stored data remotely. Since many privacy-preserving schemes have been discussed, but providing a secure data transmission scheme for cloud-centric IoMT-enabled healthcare is still a challenge. Signature and encryption are two fundamental cryptographic primitives for achieving authenticity and privacy of data, respectively, in a public-key environment. These two essential building-blocks may be composed in several ways, such as sign-then-encrypt, encrypt-then-sign, digital signature with message recovery, and sign encryption (authenticated encryption) to ensure authenticity and privacy of data simultaneously. The sign-then-encrypt and encrypt-then-sign schemes have a simple structure, which provides data authentication and privacy with a cost equivalent to the combined cost of signature and encryption schemes. In signature with message recovery scheme, anyone can extract the embedded message without knowing secret information. Recently, a more efficient solution, sign encryption has emerged to design a system that simultaneously achieves privacy and authenticity with a cost significantly smaller than sign-then-encrypt and encrypt-then-sign schemes. Besides, it allows a designated recipient to unencrypt and access the message using his secret key.

**SYSTEM ARCHITECTURE**



## **LITERATURE SURVEY**

Demonstrating that the CLS scheme fails to achieve the claimed security properties by presenting four types of signature forgery attacks. Also proposing a robust certificate less signature (RCLS) scheme to address the aforementioned challenges. RCLS only needs public channels and is proven secure against both public key replacement attacks and malicious but-passive third parties in the standard model. Performance evaluation indicates that RCLS outperforms other CLS schemes and is suitable for IoT Title: Efficient and Robust Certificate less Signature for Data Crowd sensing in Cloud-assisted Industrial IoT Author: Yinghui Zhang, Robert H. Deng Year: 2019. In this article, they propose an identity-based anonymous authentication and key agreement (IBAAKA) protocol for WBAN in the cloud- assisted environment, which achieves mutual authentication and user anonymity.

In the security analysis, they show that under the well-known computational Diffie Hellman assumption and random oracle model, the proposed IBAAKA scheme is provably secure, as well as achieves the required security properties . Title: A Lightweight Cloud-Assisted Identity-Based Anonymous Authentication and Key Agreement Protocol for Secure Wireless Body Area Network Author: Mahender Kumar; Satish Chand Year: 2020. The hospital for help, patients' health-related parameters can be monitored remotely, continuously, and in real time, then processed, and transferred to medical data center, such as cloud storage, which greatly increases the efficiency, convenience, and cost performance of healthcare. The amount of data handled by MIIoT devices grows exponentially, which means higher exposure of sensitive data. The security and privacy of the data collected from MIIoT devices, either during their transmission to a cloud or while stored in a cloud, are major unsolved concerns. Here they focus on the security and privacy requirements related to data flow in MIIoT Title: Security and privacy in the medical Internet of Things: A review Author: Wenchang Sun, Zhiping Cai Year: 2018

## **EXISTING SYSTEM**

In existing system, the state-of-the-art secure and efficient cloud-centric IoMT enabled smart health care system with public verifiability. The system novelty implements an escrow-free identity-based aggregate signcryption (EF-IDASC) scheme to secure data transmission, which is also proposed in this article. The proposed smart healthcare system fetches the medical data from multiple sensors implanted on the patient's body, sign crypts and aggregates them under the proposed EFIDASC scheme, and outsources the data on the medical cloud server via smartphone. The system does not reveal any information about the identity and medical data of the patient Li et al. present an Identity-based signcryption for low-power devices (sensors) in an online/offline setting that simultaneously fulfills the authentication and confidentiality without authenticating a recipient's public key separately.

- Omala et al. proposed a lightweight certificateless signcryption (CLSC) scheme for secure data transmission for the WBAN system. Yin et al. give an efficient hybrid signcryption scheme in a certificateless setting for secure communication for WSNs. Unlike scheme, schemes and are resistant to key escrow attack. Zhang et al. discuss a data communication scheme for the e-health system using certificateless generalized signcryption (CLGSC) scheme. Caixue Zhou points out that Zhang et al.'s scheme is susceptible to an insider attack. Thus, the scheme is insecure and vulnerable in terms

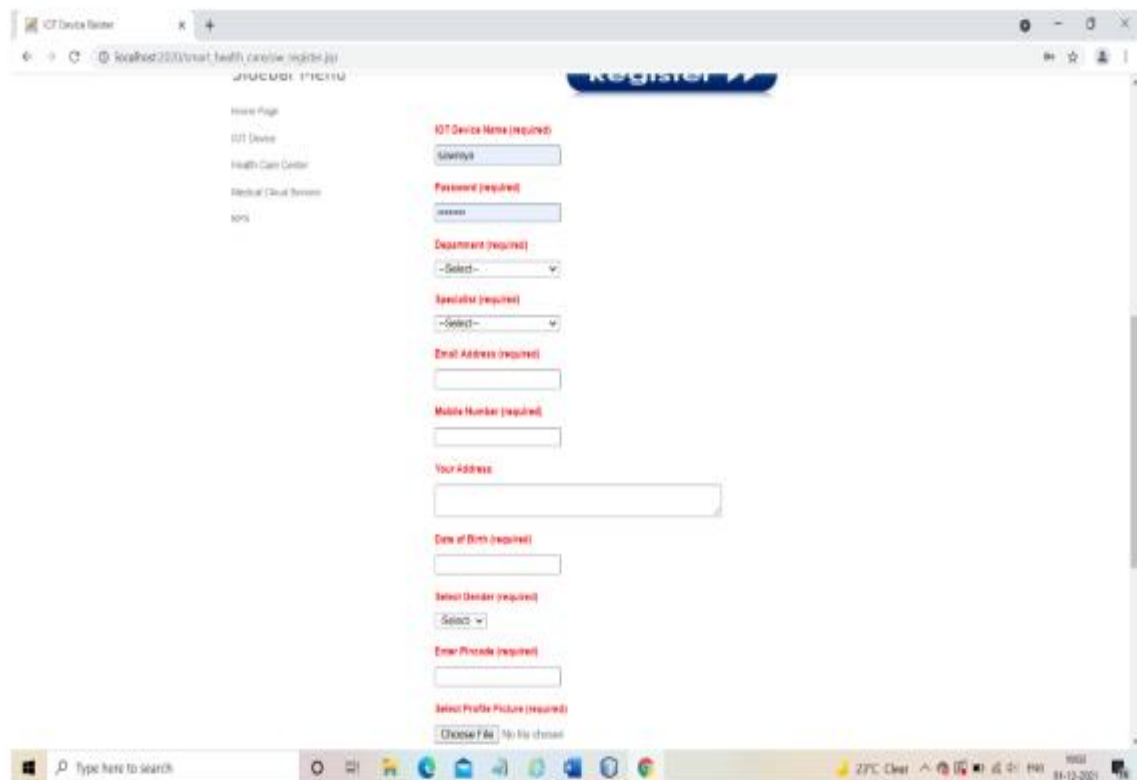
of data confidentiality. Recently, Zhou has presented an improvised CLGSC scheme for the mobile healthcare system.

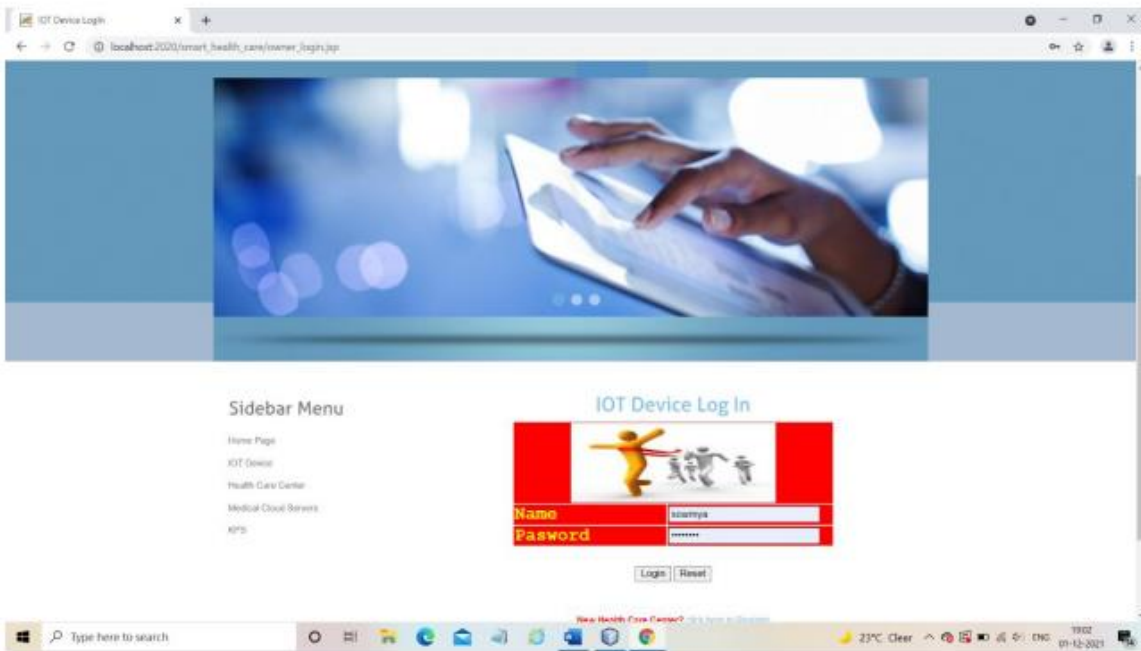
- In order to reduce the costs of transmission and overhead of verification, Selvi et al. discuss three aggregated signcryption schemes in the identity-based setting, which achieve public verifiability. Wang et al. propose a first identity-based aggregated signcryption scheme using multi-linear mapping in the standard model.
- Kar proposes a new identity-based aggregated signcryption scheme for low-processor devices. However, schemes are susceptible to the key escrow problem, which is addressed by Eslami et al., followed by presenting an aggregated signcryption scheme in the certificate less setting.
- Niu et al. propose a secure transmission scheme for heterogeneous devices, which transmits  $k$  messages from  $k$  senders in certificateless settings to  $m$  recipients in the IBC setting. Kumar et al. propose identity based signcryption scheme for secure peer-to-peer video on demand protocol.
- Yang et al. proposed a distributed secure data management with an efficient keyword search system for health IoT.
- Elhoseny et al. presented a hybrid encryption approach that is built using Rivest, Shamir and Adleman (RSA), and Advance Encryption Standard (AES) algorithms for preserving the diagnostic text data in medical images. From the above discussion, we observed that it is challenged to implement a secure and efficient cloud-centric IoMT-enables smart health care system that achieves public verifiability.

## **PROPOSED SYSTEM**

- First, we propose an escrow-free identity-based aggregated sign encryption (EFIDASC) scheme, which addresses the key escrow problem based on the idea given in the existing system.
- The system proves that the proposed EF-IDASC scheme is existentially unforgeable under chosen message attack (EUFCMA) and adaptively indistinguishable under the chosen ciphertext attack (IND-CCA) in the random oracle model (ROM) and wellknown Bilinear Diffie-Hellman Problem (BDHP).
- The system compares the proposed EF-IDASC scheme with other related signcryption schemes, in which we show that the proposed scheme consumes the least energy as compared to related schemes. Then, we propose a secure D2D-least energy aggregated-data communication protocol in the cloud-centric IoMT environment for smart health care, that security is based on the proposed EF-IDASC scheme. Further, we evaluate the energy consumption cost (in mJ) in terms of computation, storage and communication.
- The proposed secure healthcare system achieves the patient's anonymity, public auditing of the integrity of stored data on the cloud, and mutual authenticity of patient's data with public verifiability.

## SCREEN SHOTS





Server Menu

- View All Patient Details
- View All Access Control Details
- View All Transactions
- View All DR Request and Response Details
- View No. of Some Disease in Chart
- View Patient Searched Rank in chart
- View Patient File Rank in chart
- View No. of Attenders on Patient
- Log Out

Welcome to Medical Cloud Servers Main

Healthcare Solutions

Server Menu

Server Main

Log Out

View All Patient Details

ID	Patient Name	IOT Device (Uploader)	Address	Date
30	Swamy	Kiana	lg!NCwzomQgVjJve3M6UnFqYwppbzFaYXlsQmFuZ2Feb3JILTls	MDUvMD
31	Ravi	Kiana	lg*OSw60GggY3Jve3M6TWfabGVmHdmmFLGhbnadlsG9yZ50dMA==	MDUvMD
32	Gopi	Kiana	lzk*5dxYYWphatnbYW3hcixCYW3uYWsvcmUMJE=	MDUvMD
33	Kumar	Mangurath	lg4MksQjVhbnlnYW3gUn96ZCxcYW5uYWsvcmU=	MDUvMD
34	Gokul	Harish	lzcYnyw0GggQ3Jve3M6VmkYXlbnFaYXlsQmFuZ2Feb3JILTQs	MDUvMD
35	xyz	xyz	efH6	MDEvMDI
36	loerhi	loerhi	efH6	MDEvMDI

Patients Access Control Details

localhost:3020/smart\_health\_care/acc\_details.jsp

Server Menu

- Server Man
- Log Out

### View All Access Control Provided Patients and Details

ID	Patient Name	Department	Profession	Date
13	Swamy	Cardiology	Doctor	09/09/2020 16:03:03
14	Kumar	Cardiology	Doctor	09/09/2020 18:22:03
15	Gokul	Cardiology	Doctor	17/09/2020 16:18:29
16	xyz	Cardiology	Doctor	29/11/2021 13:09:14

Back

All Transactions

localhost:3020/smart\_health\_care/tx\_all\_transaction.jsp

Server Menu

- Server Man
- Log Out

### View All Transactions






Id	Health Care Center / IOT Device	Patient	Task	Date
85	Kiran	H1N1.txt	Uploaded	09/09/2020 17:52:11
86	Kiran	H1N1.txt	Uploaded	09/09/2020 17:55:16
87	Kiran	Cancer.txt	Uploaded	09/09/2020 17:58:24
88	Ramesh	swamy	Searched	09/09/2020 18:06:44
89	Ramesh	ravi	Searched	09/09/2020 18:06:53
90	Ramesh	ravi	Searched	09/09/2020 18:06:58
91	Ramesh	swamy	Searched	09/09/2020 18:07:39
92	Ramesh	swamy	Searched	09/09/2020 18:07:40
93	Ramesh	H1N1.txt	Downloaded	09/09/2020 18:08:36
94	Manjunath	Dengue.txt	Uploaded	09/09/2020 18:19:44
95	mkumarju	kumar	Searched	09/09/2020 18:21:47
96	mkumarju	kumar	Searched	09/09/2020 18:22:20

View Health Care Centers

localhost:3020/smart\_health\_care/ou\_all\_users.jsp

KPS Menu  
KPS Main  
Log Out

### View All Health Care Centers and Authorise

ID	Health Care Center Image	Health Care Center Name	Department	Profession	Status
5		<a href="#">Ramesh</a>	Cardiology	Doctor	Authorized
6		<a href="#">Imkshmanju</a>	Cardiology	Doctor	Authorized
7		<a href="#">Saran</a>	Cardiology	Doctor	Authorized
8		<a href="#">xyz</a>	Cardiology	Doctor	Authorized
9		<a href="#">soumya11</a>	Neurology	Doctor	Authorized






Windows Taskbar: 23°C Clear, 19:20 01-12-2021

View IOT Devices

localhost:3020/smart\_health\_care/ou\_all\_devices.jsp

KPS Menu  
KPS Main  
Log Out

### View All IOT Devices and Authorise

ID	IOT Device Image	IOT Device Name	Department	Specialisation	Status
8		<a href="#">Kran</a>	Cardiology	Heart	Authorized
9		<a href="#">Mansurath</a>	Cardiology	Heart	Authorized
10		<a href="#">Harish</a>	Cardiology	Heart	Authorized
11		<a href="#">xyz</a>	Cardiology	Heart	Authorized
12		<a href="#">soumya</a>	Cardiology	Heart	Authorized

Windows Taskbar: 23°C Clear, 19:20 01-12-2021



## Conclusion

In this paper, we have proposed escrow-free identity-based aggregate signcryption (EF-IDASC) scheme, which is secured against the existential forgery attack under the chosen message attack (EUF-CMA) and indistinguishable under the chosen ciphertext attack (IND-CCA2). On comparing with other schemes, it has the least energy consumption in terms of communication and computation. Based on the proposed EFIDASC, we have implemented a cloud-centric internet of medical things enabled smart healthcare system. The health caresystem has achieved secure patients PHI within BAN, and outside the BAN, and public integrity of PHI stored on the cloud without revealing information to any third entity. Further, we have scrutinized the performance of the proposed cloud-centric IoMT-based health care system in terms of computation energy and communication energy consumption.

Future enhancement: Implementing an Efficient Key-Policy Attribute-Based Encryption by encrypting all attributes and designing attribute-based search technique

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