PGD/M 11

A Framework for Using Blockchain To Enhance The Privacy, Security, Reliability, And Efficiency Of IoT-based Telehealth Systems.

I.S.R.Weerakoon
（Reg. No.: MS21900136）
M.Sc. in IT

Supervisor: Dr. Anuradha Jayakody

November 2022

Wording: 22025

Department of Information Technology
Sri Lanka Institute of Information Technology

PGD/M 11

I certify that I have read this thesis and that in my opinion, it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

………………………………………….

Dr. Anuradha Jayakody (Supervisor)

Approved for MSc. Research Project:

…………………………………………

Head / Department of Information Technology

Approved for MSc:

…………………………………………...

Head – Graduate Studies

PGD/M 11

DECLARATION

I, Isuru Sandakelum Rathnayaka Weerakoon hereby declare that the work contained in this thesis is entirely original to me and was not previously included in any other thesis or research work submitted to this or any other institution for a degree, diploma, or other qualifications. The research work was completed after I registered for the MSc program at the Sri Lanka Institute of Information Technology (SLIIT). Furthermore, I have reviewed the research procedures and take responsibility for carrying them out under the University's current research ethics, standards, and regulations, including those related to plagiarism.

Sign:

Isuru

I.S.R.Weerakoon

Date: 21/11/2022

ABSTRACT

Intelligent technologies including the “Internet of Things”, “Machine Learning”, “Deep Learning”, “Artificial Intelligence”, “Neural Networks”, and “Cloud Computing”, that enable global connectivity every second are considered an integral part of our life. The development of intelligent systems that interact with real-world objects, from controlling a light bulb to automating healthcare facilities, has been enormously accelerated by the Internet of Things. Simultaneously, people’s life expectancy is growing by the day, resulting in a massive growth in the elderly population, which has led to a huge need for healthcare services. This has caused an increase in hospital admissions globally. However, unless their health deteriorates seriously, the majority of elderly individuals may be monitored and treated remotely. Therefore, to conduct and handle medical transactions while upholding strict security and privacy standards, an autonomous sophisticated system must be established. A high-quality, highly reliable, and highly efficient system that uses many sensors to scan patients’ health parameters and via them to track and monitor non-critical patients may have prevented a pandemic like Covid-19 that has forced millions of people to attend healthcare facilities. The novel Internet of Things security framework presented in this thesis is built on blockchain networking technologies and is intended for usage in healthcare Internet of Things systems. All transactions handled through this framework will be encrypted using a unique encryption method suggested in this thesis that is constructed on top of the “Advanced Encryption Standards” algorithm, while the “Proof of Elapsed Time” consensus algorithm is used as the blockchain. The idea of blockchain technology is taken into consideration in this case since any information that is accessible over the Internet is subject to different security flaws, including the patient’s private medical information, which should not be accessed by unauthorized parties. And the decentralized nature of blockchain technology causes an issue known as “disease overlapping”, notably in the healthcare industry. As a remedy for this, the suggested security framework would construct separate blocks in the chain for each transaction alteration allowing only the doctors and hospital management to update patient reports, analytical data, prescriptions, drugs, new symptoms, etc. The thesis’s overall goal is to provide healthcare stakeholders, particularly patients, with an effective, reliable, highly secure, and affordable healthcare solution. However, other stakeholders in the healthcare sector will also profit from it. Furthermore, the adoption of blockchain not only protects transactions but also increases confidence among stakeholders in the healthcare sector.

ACKNOWLEDGEMENT

First and foremost, I would like to express my heartfelt gratitude to my father, mother, and sisters for their endless support and encouragement to make this thesis project a great success.

I would like to extend my sincere gratitude and appreciation to my supervisor, Dr. Anuradha Jayakody, for his limitless support, supervision, and close mentoring. Sir, there aren’t enough words to express my gratitude for your unwavering support and devotion throughout the thesis. Then, in particular, I would like to thank Mr. Samantha Rajapaksha, Head of the Department of Information Technology at Sri Lanka Institute of Information Technology (SLIIT), for all the encouragement and assistance he provided for the successful completion of my thesis. And thank you so much for being a wonderful department head who assists students on a variety of topics in addition to academic ones.

I would like to use this opportunity to express my heartfelt appreciation to the university, SLIIT, for allowing me into the MSc in Information Technology degree program. If I hadn’t been accepted into the program, I doubt I would have considered pursuing a thesis project like this. And special thanks for providing students with all of the necessary resources, expertise, advice, and support. In addition, I want to express my sincere gratitude to all the professors who helped me with this research either directly or indirectly by providing guidance and assistance. Finally, I want to thank everyone who was involved in the project, especially my friends, for their encouragement and help in getting the job done.

TABLE OF CONTENTS

List of Figures

List of Tables