A Secure Healthcare System for Privacy-Preserving based on Blockchain Technology

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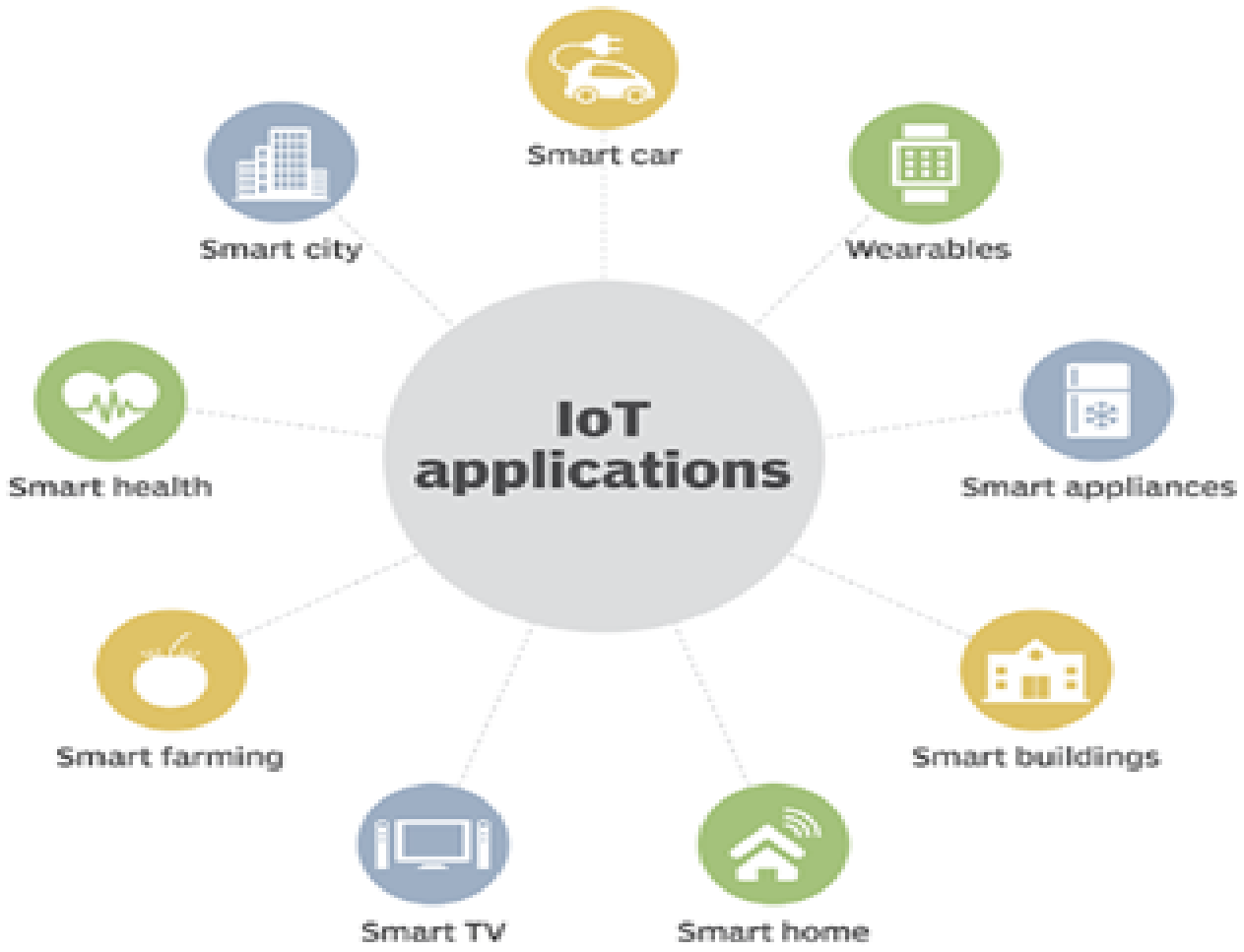
Mohammed Adnan Mohammed : received the master's degrees in computer engineering and automatic control from the Mansoura University, Egypt, in 2016. Now, He is a Ph.D student in computer engineering and a member of the Computer & Embedded Systems Laboratory in the National School of Engineers of Sfax, Sfax University, Tunisia. He is working on the internet of things (smart healthcare) and special focus on protecting and secure the data of smart healthcare systems using blockchain.

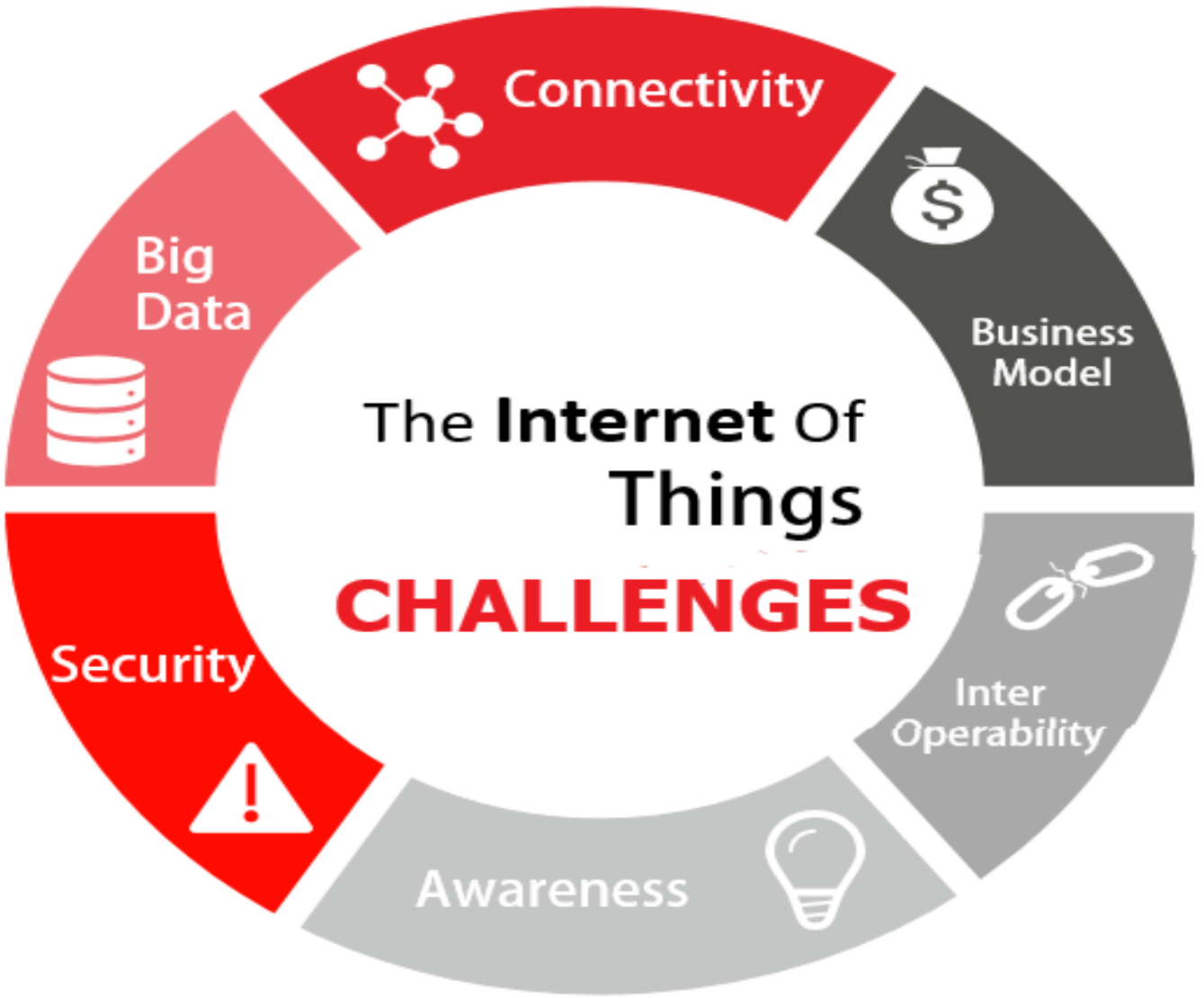
Internet of Things (IoT)

- The concept of Internet of Things (IoT) is used for enables physical devices to be connect with each other in smart network and use ubiquitous computing in different environment to improve people's lifestyle.

- It uses computers or mobile devices to control basic home , park or factory functions and features automatically through internet from any where around the world.



Applications of Internet of Things (IoT)



Challenges that face IoT systems

Blockchain Technology

- A blockchain is an immutable distributed database (decentralized ledger) to which new time-stamped transactions can be appended and grouped into a hash-chain of blocks .
- The decentralized ledger keep a record of the various transactions carried out in the network right from the beginning of the chain.
- The ledger is shared among different nodes that participate in the network, with each peer having its copy of the ledger.
- Each block in the chain is connected to the previous one using cryptographic techniques, which makes the system secure and resistive to malicious attacks and malpractices.

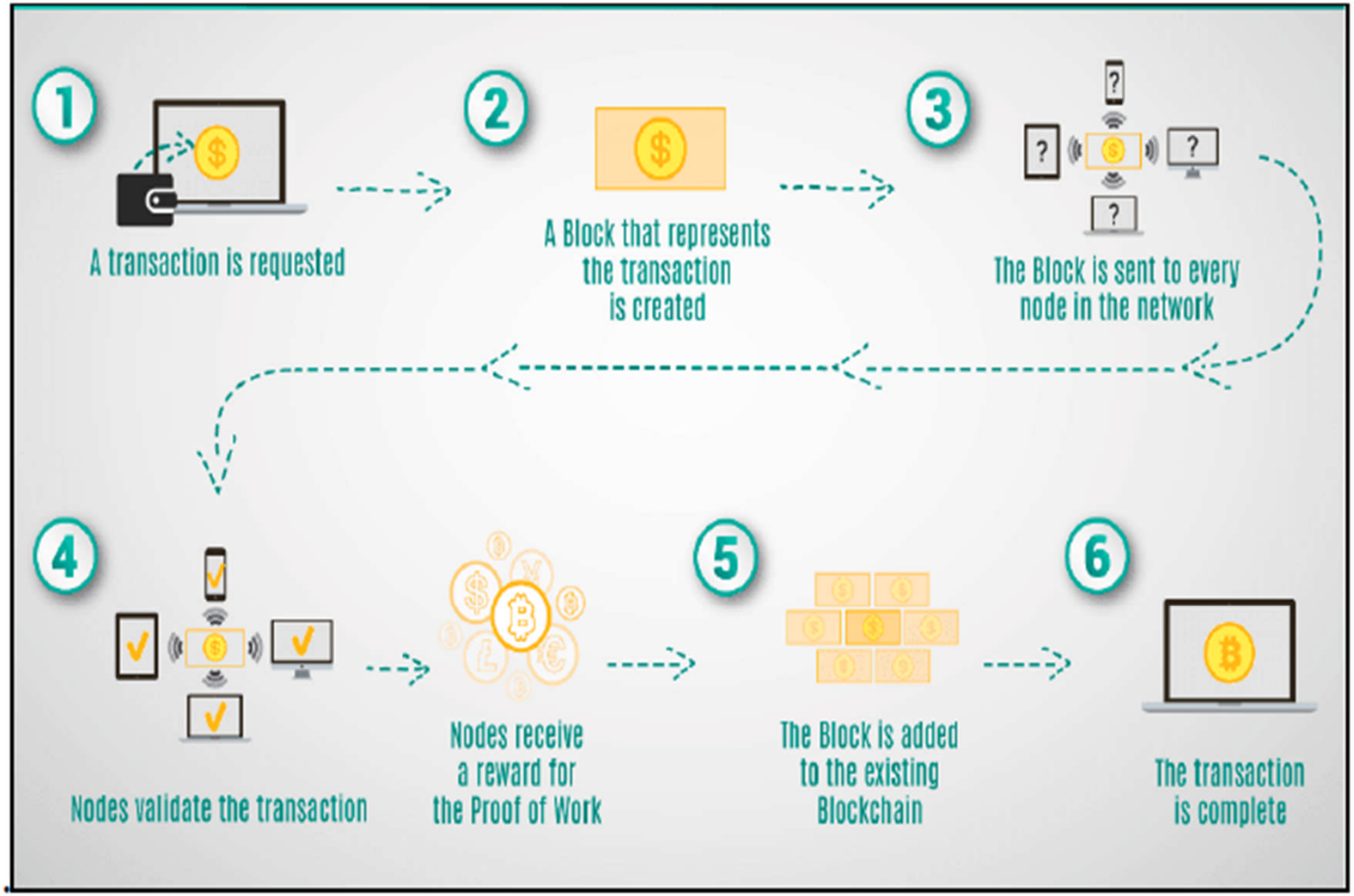
Blockchain Technology

Blockchain types:

		Blockchain systems		
		Public Blockchain	Private Blockchain	Consortium Blockchain
Features	Access	- Anyone	-Single organization	-Multiple selected organizations
	Participants	- Permissionless - Anonymous	- permissioned -Known identities	- Permissioned -Known identities
	Security	-Consensus mechanism - Proof of Work / Proof of Stake	- Pre-approved participants - Voting/multi-party consensus	- Pre-approved participants - Voting/multi-party consensus
	Transaction Speed	- Slow	-Lighter and faster	-Lighter and faster

Example of the Blockchain working

Adding a transaction in a blockchain



Blockchain to secure IoT networks

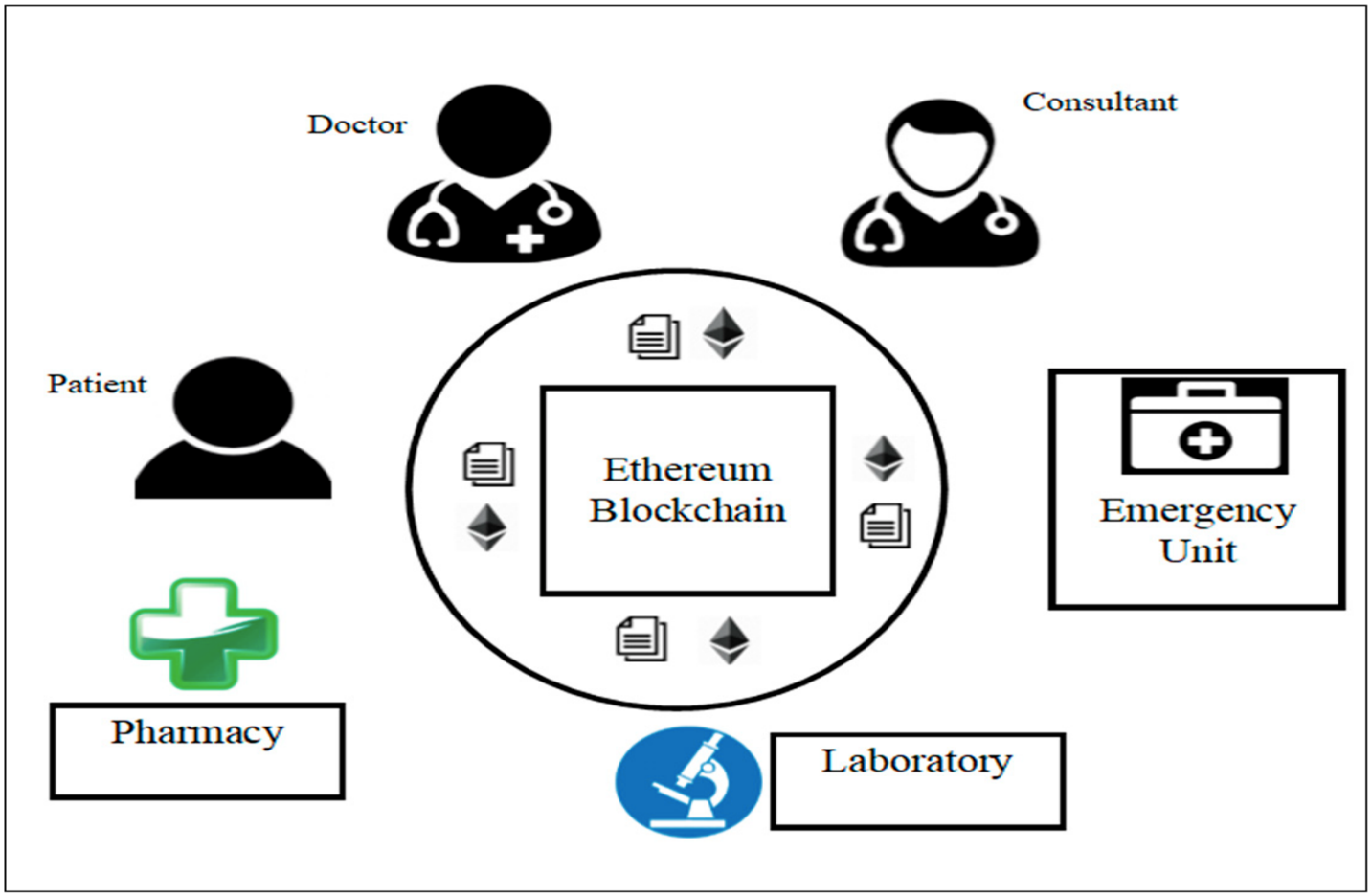
The use of IoT healthcare systems is increasing especially with the appearance of coronavirus disease (covid-19) around the world. Medical staff can employ IoT systems to avoid contact with patients.

The big challenge that faces IoT healthcare is security issue.

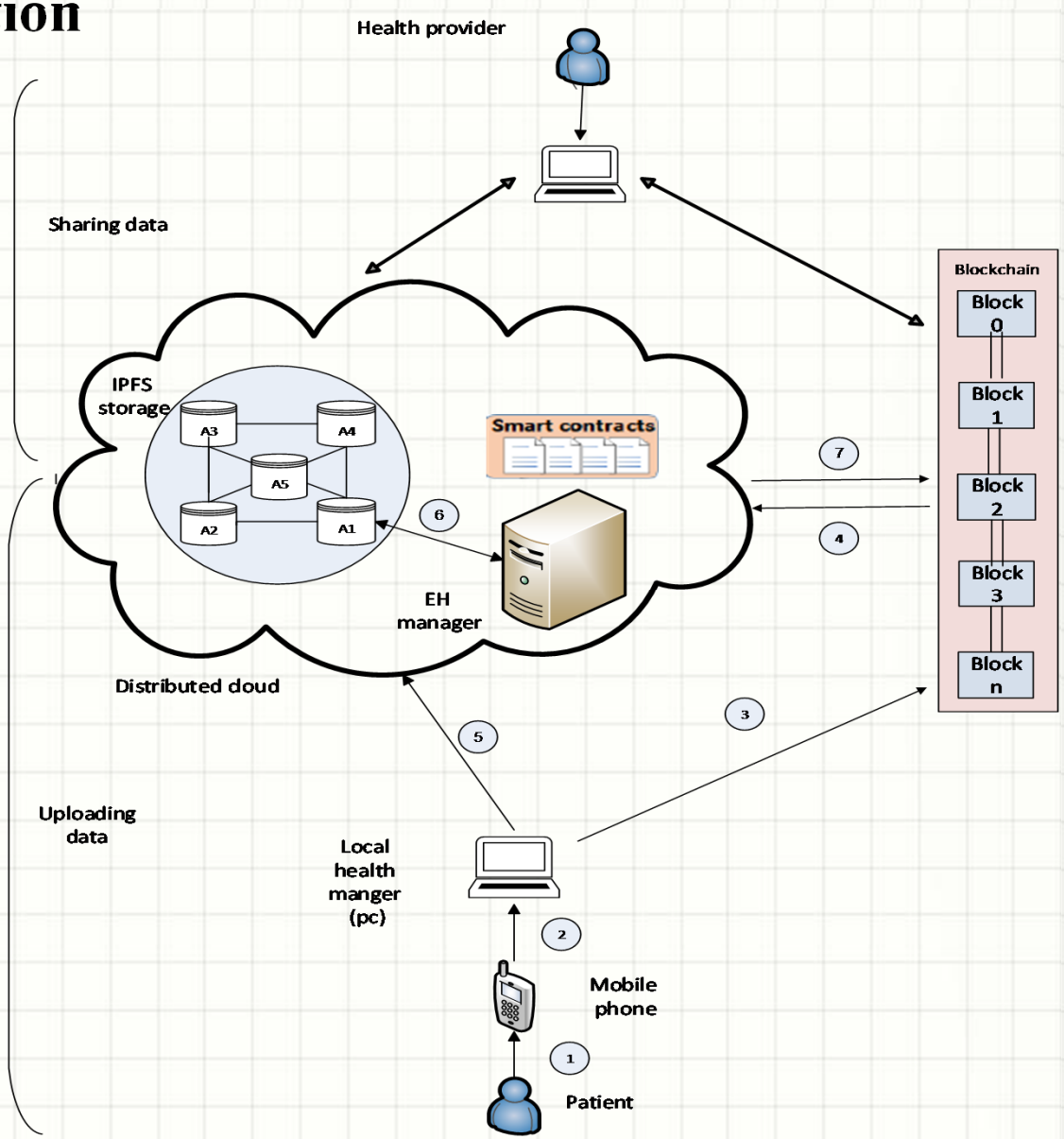
Create the integration between IoT and Blockchain to overcome smart healthcare system challenges as follow:

- Trust (build trust between parties and devices, and reduce the risk of collusion and tampering).
- Reduced costs (remove overhead associated with middlemen and intermediaries).
- Accelerated transaction rate (reduced settlement time).

Example of using blockchain in IoT healthcare systems



Proposed Solution



Results

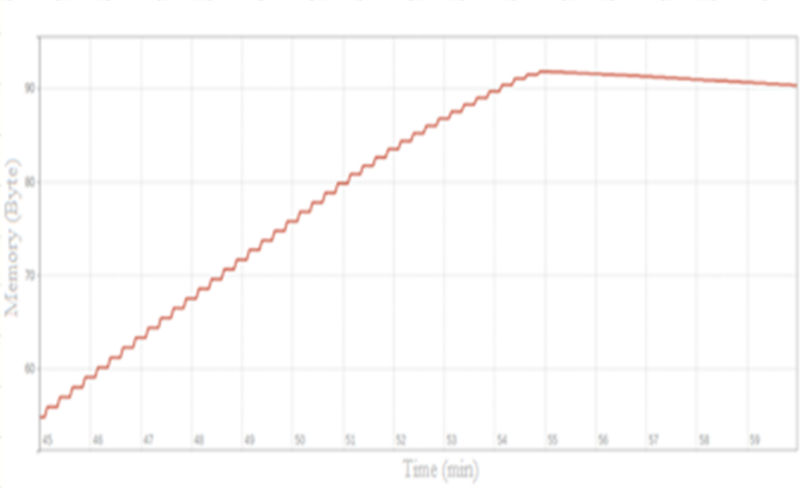


Figure 3: The average memory usage.

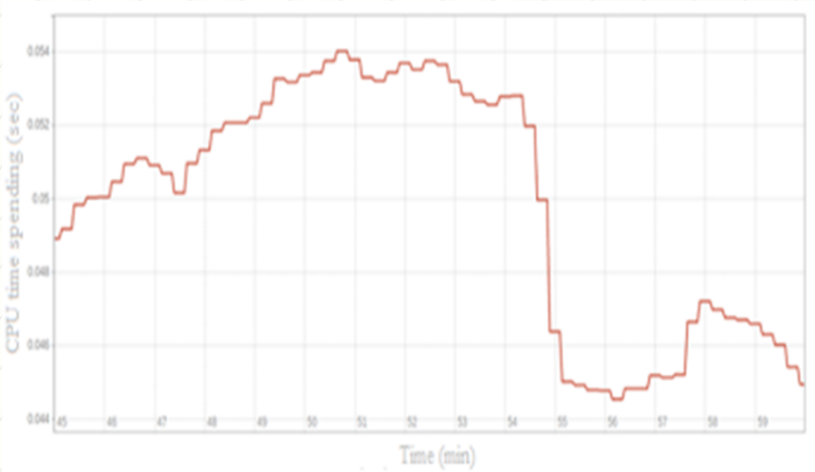


Figure 4: The average amount of CPU time.

Conclusion and future work

- The proposed a system that consists of two-part : uploading medical data of patients and sharing or retrieving data by healthcare providers (doctors, hospitals, etc.).
- Performance evaluation in terms of memory and CPU overhead is conducted. As presented by the implementation results, the proposal system allows users to share medical data in a reliable and quick manner.
- It uses different keys for encryption and decryption of medical data and prevents unauthorized access to the e-health system.
- The proposal system decrease consumption of network resources and computational overhead by storing actual medical data in a distributed storage system (IPFS).
- Future work, will expand proposed system and implement it on more complex scenarios.

THANK YOU ANY QUESTIONS