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Cloud Mining based Congestion Control Blockchain DB

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Abstract: ***Nowadays, more and more companies migrate business from their own servers to the cloud. In this paper, our attention focuses the energy efficiency with the invasion of computational requirements, due to the dilemma i.e., Data-Centers (DCs) consume a tremendous amount of energy every day. We also explore the problems with Blockchain regarding the energy-aware resource management on the cloud layer as a database, where*** **Green Energy** ***with volatile and huge volumes is stored in the form of data. Via proposing a robust*** **CM-based CCBdb** ***model, we save the energy consumed across SDN-network using the proposed mining algorithm. This paper has attempted to study the timeliness of Green Energy for the sustainable use of electric power across the globe. At the very first, we study research into brief discussion associated with Smart Grids since it is the herald of Energy Internet and various other studies which discuss the developments that are likely to enable a smooth transition of the present electricity system to Energy Internet. Moreover, the concept of the Internet-connected smart grid, also called the Energy Internet has been derived as a novel proposal to guarantee energy from anywhere at any time by the interconnection of electricity producers cum consumers (prosumers) from the vast potential of energy sharing networks. Prosumer enables to sell and buy surplus/required electricity with renewable energy sources/systems, electric loads, and storage devices. The decisive objective of sustainable development is to build a smart structure of society. However, Blockchain with marvelous attributes establishes a favorable application for the Green Energy paradigm. In this paper, we also aim to provide a brief survey on the applications of Blockchain. We also summarize several related practical projects, trials, and products that have emerged recently. Finally, we discuss essential research challenges and future directions of applying Blockchain to Green Energy security issues.***

Keywords: Green/Sustainable Energy, Prosumers, Congestion, Blockchain, BlockchainDB, Cloud Mining

1. Introduction

More detailed discussion about the Blockchain DB technology, at first, we need to be concerned about, now, one burning point i.e., Human society is facing the energy shortage, and ever-increasing energy demand with consideration of world issues like critical challenges of climate change, more frequent extreme weathers, etc.

Since the last few years, as an emerging distributed computing technology, Blockchain provides a way to support complex interactions among different modern power systems that are rapidly evolving into secure and robust distributed infrastructure. The related issues drive the reformation of the aging **Green Energy** structure. Since the conception of the ***''Smart Grid''*** in the early21st Century [1], modern power systems have been whirling in the direction of being more environmentally friendly, and efficient. During the last few years, there of the ***''Energy Internet''*** [2] as a proposed concept thrust the merger of all sorts of computing systems in a distributed environment. The current shift from centralized to distributed infrastructure naturally calls for robust, effective, and secure systems to support complex data management.

In this paper, Firstly, Blockchain with its state-of-the-art is introduced. Furthermore, we started with the following research questions to find out about the usability and the current usage of Blockchain technology regarding climate change. The first research question (RQ1) deals with the support of the technology and asks: Can Blockchain support actions against climate change? The second research question (RQ2) is envisioned to flash slight light on Blockchain application areas and so established as what are now in-place Blockchain-based application areas that counter to climate change?

2. Blockchain Synopsis

Blockchain mainly uses digital information that is to be recorded and distributed but not edited in the form of its primary objective.

In such a manner, Blockchain is the origination for unalterable everlasting ledgers (or records of transactions) that cannot be altered, deleted, or destroyed. Therefore, Blockchains are also said to be Distributed Ledger Technology (DLT).

David Chaum, in 1982, envisioned a first-of-its-kind Blockchain-like protocol in his dissertation, i.e., Computer Systems Established, Maintained, and Trusted by Mutually Suspicious Groups. This perception was boosted up by Stuart Haber and W. Scott Stornetta in 1991, where they further outline the procedure of a secured chain of blocks with cryptographical encryption [3].

How the data is structured in a typical database or in a Blockchain considered as one vital key difference between both. In a database system, data is usually structured into tables, whereas a Blockchain, as its name infers, provides a new approach to transform the centralized operation pattern of the database to be a decentralized and fully autonomous pattern. In Blockchain, the data is structured into chunks (blocks) that are threaded together via cryptography [4], then all nodes in the network verified that data by a certain consensus algorithm, and replicate it(data) at each node.

This signifies, there are three important technologies incorporated into the Blockchain - cryptographic keys, a digital ledger, and a peer-to-peer network. The following attributes and properties of Blockchains are given and illustrated in Figure 1–

- New transaction data is entered into a fresh block as it arrived to the Blockchain. As soon as the new block is complete with transactions, it is attachedto the previous block, so that the data is chained together cryptographically in chronological order.
- Various forms of information can be stored on a Blockchain, but the most general use up to nowis as a ledger of transactions.
- Decentralized Blockchains are immutable, which means that the data entered is irreversible.

2.1 How does a Blockchain Work?

The idea of decentralization is new. It has been highlighted in 1991with the exposure of Blockchain technology. It has been also announced brand new apprehension that trends decentralization widely known, i.e., *Bitcoin*. Through this technology, if one who wants to transfer/sends bitcoin to another one, it doesn't have to be faced with a central organization/agency. That means Blockchains are possible to use to come forward for parties that do not trust each other and make shared data accessible among them [5].

Blockchain fundamentally facilitates data storage in distributed mode at different network sites in which every node in the network has a copy of the ledger. When a new block contains one or more data items then this new node is verified with all existing nodes, further inserted into the ledger and at last, synchronized among all nodes. Each blockin Blockchain is connected through *hash-pointers*:

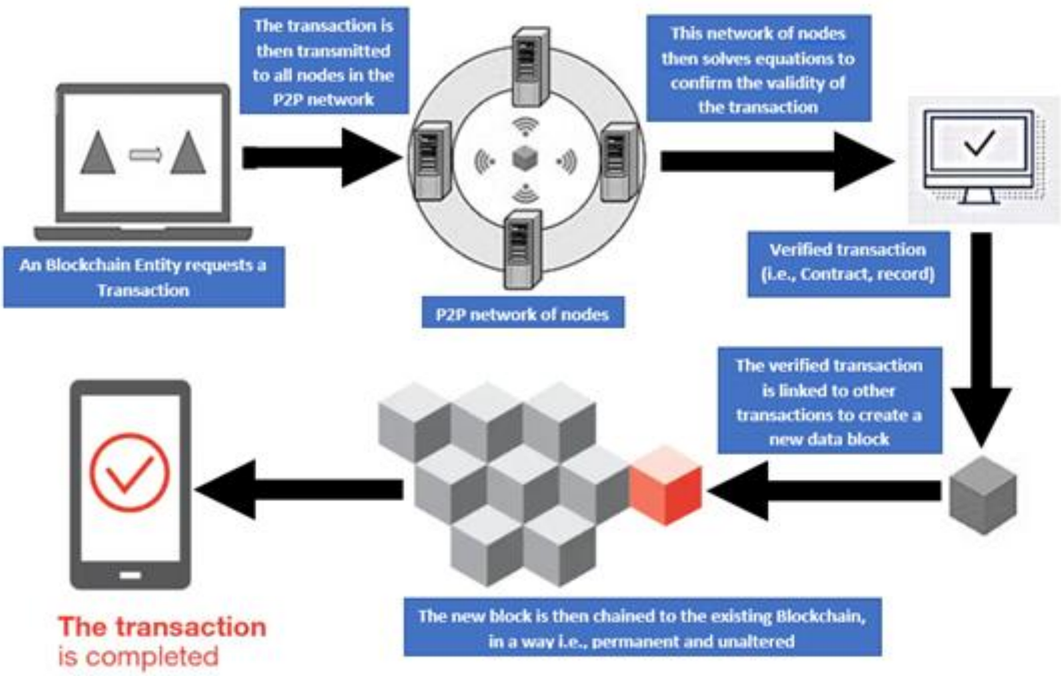

Figure 1: The concept of Blockchain operation – Transaction Process

- Each block contains the hash of the previous block
- This hash gives each block its location in the Blockchain
- Tempering the content of any block can easily be detected

New transactions validation is done by network nodes to make sure that: –

- Transactions on the new block do not conflict with each other
- Transactions on the new block do not conflict with previous blocks' transactions

Network nodes need to agree on ***Consensus*** [6, 7]i.e., defined as the next block to be added to the Blockchain.

NAKAMOTO CONSENSUS

1) Naturally, network nodes compete to each other to solve a puzzle
2) This puzzle is computationally prodigal
3) Whenever a network node mines/find a solution: -
    - It adds its block of transactions to the Blockchain
    - It multi-casts the solution to other network nodes
    - Other network nodes accept and verify the solution

The Blockchain-enabled network is open that means it is used and connectable by anyone.

Different platforms of Blockchain attempt to optimize the process of the transaction to improve the performance of Blockchain. To speed up the operation of transactions, some platforms add a database layer above the Blockchain [8]. Except for this simplification of the consensus mechanism is considered by some researchers to reduce the calculated workload [9].

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2.2 Blockchain Adoption Challenges:

Here is the list of the top five Blockchain adoption challenges [10-12] mentioned below: –

- ***No Regulations***: There are currently no regulations on how the transactions in Blockchain should be written. Therefore, not any platform can follow any definite rules when it connects to the Blockchain.
- ***Lack of universal Standards***: –Despite a broad array of networks, as regards regulations, we now lack universal standards for writing transactions on a Blockchain.
- ***Lack of Privacy***: – Blockchain and privacy don't go reasonably well side by side. Blockchain is visible for everyone to view because it uses an open ledger.
- ***Security Problems***: –All of us know that high security is boasted Blockchain technology. But like the other technologies, there are some security-related loopholes init. The lack of Blockchain technology is a set of monitoring lapses i.e., an easy target hot spot for collusive tendering. There is a 51% attack possibility avail in current Blockchain technologies. A collusive entity would have full control, in a 51% attack of the majority of the network's mining hash-rate, and would be able to manipulate Blockchain. In this attack, hackers can alter the transaction process by taking over the network and even restrict to the creation of a block by other people.
- ***High Energy Consumption***: – In order to escape Blockchain, many organizations are not using it altogether just for energy consumption problems. For such challenge, the challenging feature of Blockchain is the consensus mechanism. Consensus is defined as to validates a transaction of Blockchain.

We know that however different Blockchains use different consensus mechanisms to mine blocks of transactions. The term mining refers to guessing the solution to a mathematical problem (unique to the group of transactions) that cannot be calculated directly. Mining is a competitive part of the validation process for finding an integer that results in the hash value of the block being under the current target difficulty requires many attempts (i.e., likely to be a puzzle), by many competing users(said to be miners), which consumes much more computing power.

At the moment, approx. 0.2% of the total global electricity is used by miners. Miners will require to consume more power than the world can produce if Blockchain continues to escalate. Therefore, this challenge becomes a fundamental challenge of Blockchain technologies.

Well, Blockchain can utilize other novel consensus methods to validate the transitions. Such contemporary consensus algorithms require very little energy for mining the transaction.

The following table shows the energy consumption of a bitcoin in terms of electricity consumed, carbon footprint, and global power consumption: -

Description (Terawatt Hours-TWh, Kilowatt Hours-kWh, Kilotons-kt)	Values
Current estimated annual electricity consumption (TWh)	73.12
Current minimum electricity consumption (TWh)	57.76
Annual carbon footprint (kt of co2)	35.830
Electricity consumed per transaction(kWh)	892
Carbon footprint per transaction(kg of co2)	437.26
Minimum global power consumption of software(TWh)	22
Peak power usage of bitcoin network(TWh)	67

Table: Energy Consumption of a Bitcoin

3. Blockchain DB

Blockchain Database acronyms for BlockchainDB, as a storage layer that outspreads Blockchainby classical data management techniques (e.g., sharding) over and above provide a query interface to assist the acceptance of Blockchains for standardized data sharing.

BlockchainDB has different difficulties: First and foremost, a significant challenge is their limited performance. Recent benchmarks [13] have shown that state-of-the-art Blockchain systems such as Ethereum or Hyperledger, which can be used for building general applications on top, can only achieve 10'sor maximally 100's of transactions per second, which is often way below the requirements of modern applications. To tackle these issues, on top of the storage layer, BlockchainDB facilitates tamper-proof and de-centralized storage [14] with the following functions: -

F-1 <u>*Partitioning and Partial Replication:*</u> A major performance bottleneck of Blockchains today is that all peers hold a full copy of the state and still only provide (limited) sharing capabilities. In the database layer of BlockchainDB, we allow applications to define how data as transactions is replicated and partitioned across all available peers. Thus, applications can trade performance and security guarantees in a declarative manner.

F-2 <u>*Query Interface and Consistency:*</u> In the DB layer, BlockchainDB additionally provides shared tables as easy-to-use abstractions including different consistency protocols (e.g., eventual and sequential consistency) as well as a simple key/value interface to read/write data/transactions not realizing the inner features of a Blockchain system. Henceforth, to support SQL we would like to amplify the query interface to shared tables with full transactional semantics.

To enable data sharing, BlockchainDB provides so-called shared tables as the main abstraction [14] defined by its schema. For accessing a shared table, clients can use the put/get interface of BlockchainDB.

The key idea of BlockchainDB is that data as transactions is not replicated to all peers to avoid the high overhead of Blockchain consensus. Instead, shared tables are partitioned (i.e., sharded), thereby each shard is implemented as a separate Blockchain network. Moreover, shards are only replicated to a limited number of peers instead of replicating the data to all peers.

As a first step of a data sharing scenario, a new shared table has to be created with a simple-to-use abstraction in BlockchainDB. Because it provides for untrusted parties to access transactions via shared tables.

4. Main Findings of the Proposed Methodology

A Blockchain-based initial proposed model is presented to place P2P energy trading and reflect blockage of the trading (referred to as the trilemma of Decarbonization, Decentralization, and Digitalization). To answer the paper's research questions (RQ1 and RQ2), the ***Cloud Mining based Congestion Control BlockchainDB*** (CM-based CCBdb)model is conducted. Therefore, to support fast and frequent trading with scalable, robust, and secure features using a cloud mining system is our proposed model that operates on top of a Blockchain congestion control database.

4.1 Basic Concept

***Framework Overview:* –** Blockchains are designed to provide security to all types of data so that no one can tamper with them. But also, at the same time, they are found to be consuming an enormous amount of energy due to mining at every node. So, we are trying to find the solution for solving the energy issues of Blockchains for reducing any environmental threat that is associated with the use of Blockchains and also, at the same time, trying to switch to applying renewable sources of energy with cloud mining (as shown in the Figure below) for sustainable development. We have four different layers in our proposed model as follows: -

- *The Data Sensor Layer* contains data perceived through large-scale sensors such as product type and product quantity, device performance status, and other data of several parameters. Perception data are obtained by sensors and uploaded to the client-server for comprehensive analysis and sharing. Perception information, after being obtained from the sensors, is sent and shared on the client's server for analysis.
- *The Fog Layer* includes the clients, the client-server, and also the community recognition server. The responsibility of the client-server is basically getting the observation data and then transferring observed data to the Blockchain network to be uploaded, and also to the community detection server. The responsibility of the community detection server is gathering entire data and execution of the community detection technique, along with producing the community detection outcomes, and also sending such data to the Blockchain network.

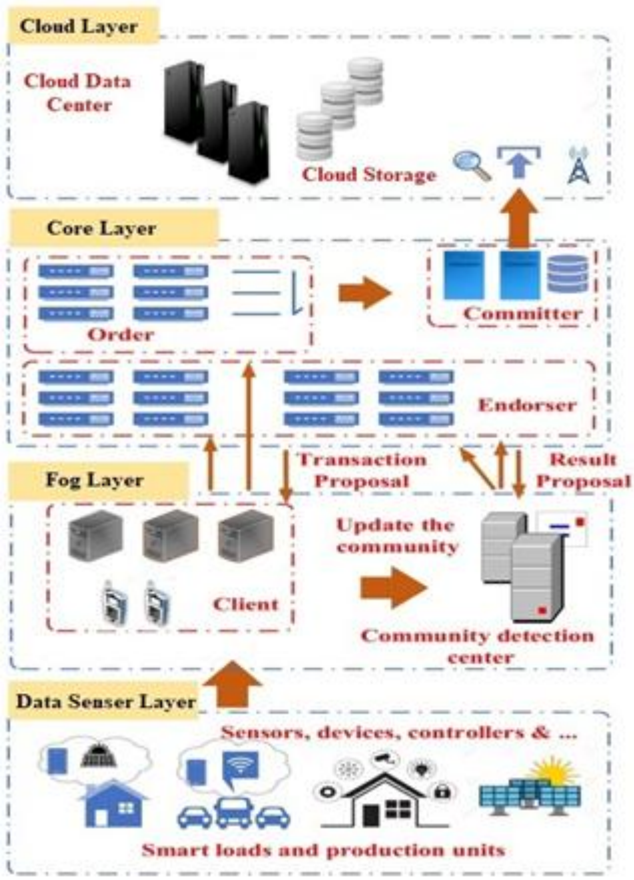

Figure 2: Cloud Layer-embodied Blockchain Structure for Energy Trading

- *The Blockchain Layer* is made based on the hyper-ledger fabric structure, it consists of confirmation, order, and committer nodes. The confirmation node has the responsibility of ensuring the transaction is offered through the client-server. The order node has the responsibility of classifying and packing the transactions into the blocks. The committer node also has the responsibility of validating and adding blocks into the BlockchainDB. The Core Layer with a common transaction procedure is designed as the following stages: -
  - The client-side makes the transaction offer.
  - The execution of the transaction is emulated by the node.
  - The client transmits the transaction into the consensus service.
  - The transactions with consensus are ordered by the client, then create new blocks, and render the transactions.
- *The Cloud Layer*is a centralized system consisting of BlockchainDB, which has sufficient computing resources and sufficient storage. Cloud layer with cloud data center and cloud storage that enables BlockchainDB are responsible for delivering storage and data access. This layer is also responsible for cloud mining.

  Sustainable energy trading is an important technical guarantee for the realization of the "Cloud Mining" (referred to as CM) system that refers to a cloud-based integration of core mining operations (consensus algorithm) through the effective use of cloud technologies, cloud resources, and cloud services.

4.2 Why Cloud Mining?

The technology used to mine (in solving the proof-of-work cryptographic math puzzles) develops rapidly as there is a competitive hash rate arms race to receive the mining rewards. Hash Rate is the speed at which a computer is completing cryptographic puzzles (guessing hashes that are each puzzle's solution) required to generate a block [15].

There are also barriers to entry into proof-of-stake mining: the larger stakes are able to process more transactions, and smaller cryptocurrency holders are at a disadvantage [16].

Regardless of the reason for not being able to mine directly, a solution exists: hire someone else to mine for us. This is the essence of "Cloud Mining" that uses Delegated Proof-of-Stake (DPoS) consensus algorithm. The user receives the block rewards and/or transaction fees from mining or transaction validation without managing the hardware and node software [17].

5. Cloud Mining based Congestion Control BlockchainDB

To the best of our knowledge, none of the previously proposed research architectures fully tackled the *congestion control in Blockchain* challenges.

As a consequence, we introduce the first novel, flexible, dynamic, resilient, consistent, and rich *Cloud Mining based Congestion Control BlockchainDB* (CM-based CCBdb).

CM-based CCBdb is a Blockchain-based distributed network architecture that brings cloud mining along with computing resources to the edge of the network using a distributed fog computing infrastructure. We study in this paper, an intelligent energy-aware resource management problem in Blockchain congestion control database on the cloud layer. Where we unambiguously consider a transaction with a number of requests that involve a number of computerized resources to. These requests execute on virtual machines (VMs)and both(requests and VMs) are located in by numerous cloud BlockchainDBs associated with the power grid and also Green Energy (e.g., solar, wind, and tide).

In this paper, we discuss the mitigation of congestion in the cloud system through the Blockchain DB approach. All of us are aware that before storing the data in the cloud it is decrypted. In the distributed network –cloud-based BlockchainDB, using cryptographic algorithms we encrypt all the block data into a hash code, and then a hash key is generated for each block. This greatly minimizes the processing and speeds up the DPoS validation process that is executed by miners.

As an applied instance, one of the prime drifts for the renovation of modern technology is Internet-of-Things (IoT) [18] which use the Internet for data communication among enabled physical devices which can execute a smarter world. This means future devices may automate all over the places to transform our lives as *EARTHLINGS* along with sustainable development. After introducing IoT technology such applications are possible to use that already appeared in our life in diverse fields, such as smart devices, smart homes, smart cities, and smart transportation [19, 20].

a) ***Problem Theory:*** -The proposed model is a hybrid Blockchain trust contract strategy that aims at immutably, reliably, and dynamically recording the message and recent request trustworthiness in a distributed edge-based Blockchain network without requiring a third-party authority. CM-based CCBdb is the Blockchain congestion control building block that promotes accurate and secure data congestion prediction.
b) ***Architecture:*** -Figure portrays the CM-based CCBdb architecture that is mainly composed of BlockchainDB on the cloud layer, Prosumers and their requests, Green Energy, and grid. In the proposed model, energy providers wish to execute VMs on the cloud layer. Therefore, in this way, such a proposed system could use more Green Energy. For instance, Google manufactures its Data-Centers (DCs) where Green Energy based infrastructure available, and to consume power Green Energy could be used without the greediness ofa low-priced basedgrid power [21].

Network congestion arises due to the migration process which is always more than migrating. This issue considers as migrating requests of VMs to DCs could be an excessive price. To minimize the total energy cost is our goal making use of both green energy as well as grid power.

We first recommend a *resource management framework* to address this issue i.e., based on Blockchain, that records all the activities in transactions as a form of distributed data structure. Different from other frameworks, with the help of Blockchain, our proposal does not require any scheduler, bringing extra energy costs and decreasing the robustness of BlockchainDB.

As shown in the Figure, Blockchain DB distributed in different areas is denoted by a set

$$S = \{S_1, S_2, S_3 \ldots\ldots\ldots S_m\}.$$

The enlarged computational resource use will consume additional energy whenever a mass of data arrives. The core mechanisms of our proposed framework are transaction and mining. The transaction is used to execute energy consumption and request migration, and mining brings superior robustness.

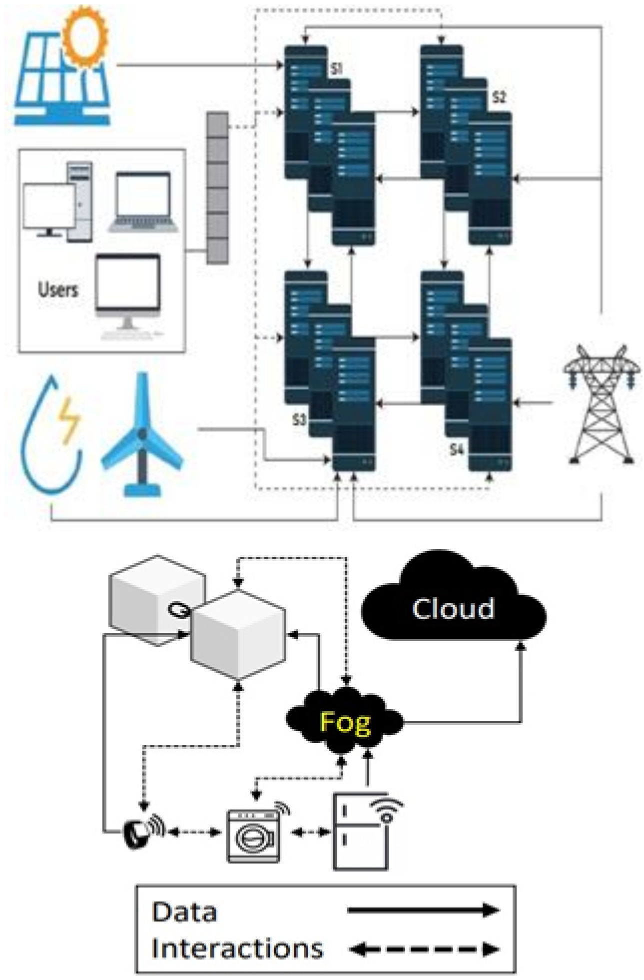

Figure 3: Model for CM-based CCBdb

5.1 Transaction

Within the BlockchainDB context, the transaction serves request migration by recording the resource allocation of the request. To illustrate the mechanism of applying transactions in request migration, we introduce our proposed BlockchainDB-adapted transaction protocol. The Fog layer is the interconnection of sensors with computing capabilities through the internet. Smart devices in the Data Sensor Layer are the main building blocks for smart environments, which aim at providing a comfortable living experience for humans via performing tasks using these devices. Smart gateways are endowed with noble computational resources where Fog servers are generally installed. To retain the network bandwidth and decrease the load in its data centers, these servers reject unwanted communication to the cloud. However, the Fog Computing paradigm is used to sustain the Cloud for the purpose of mitigating latency insularity of IoT applications in smart environments. Blockchain can be used to increase the Data sensor's device automation and solve a number of its limitations, including security, privacy, and scalability. That makes Blockchain one of the enabling technologies for smart environments. Using Blockchain for a decentralized monetary transaction and digital asset trading is also an enabler for IoT devices in smart environments. Blockchain technology is a good solution to mitigate the problems of traditional central communication and management systems for large-scale IoT devices.

BlockchainDB, as a component of the proposed model, is another example of a Blockchain-based database like framework for decentralized IoT networks. Blockchain is able to create traceable IoT networks, where transaction data are recorded and verified without intermediary management and control. However, Blockchain can solve security, privacy, and data integrity issues in a decentralized manner. Denial of Service Attacks (DoS) and Distributed Denial of Service Attacks (DDoS) target network services from serving legitimate users, devices, and applications. Such attacks can target Software-Defined Networking (SDN) controllers to malfunction and paralyze the whole network. Blockchain can mitigate latency issues, like congestion and transmission delays, and help avoid single-points-of-failures in centralized network architectures. Blockchain with Artificial Intelligence (AI) in Smart Energy Management – ***SEM*** systems using IoT and SDN, this integration allows for sustainable energy management and efficient load prediction in a trustless environment.

For determining Blockchain performance, consensus algorithms are a vital aspect, and for this reason, various researchers endeavor to raise security and drop power consumption. There is always a security vs. performance trade-off when choosing between different Blockchain platforms or consensus algorithms.

A simplified architecture for Smart Environments is shown below using the technologies discussed before that show the use of Blockchain in trustless environments enclosed with BlockchainDB for securely sharing and storing data.

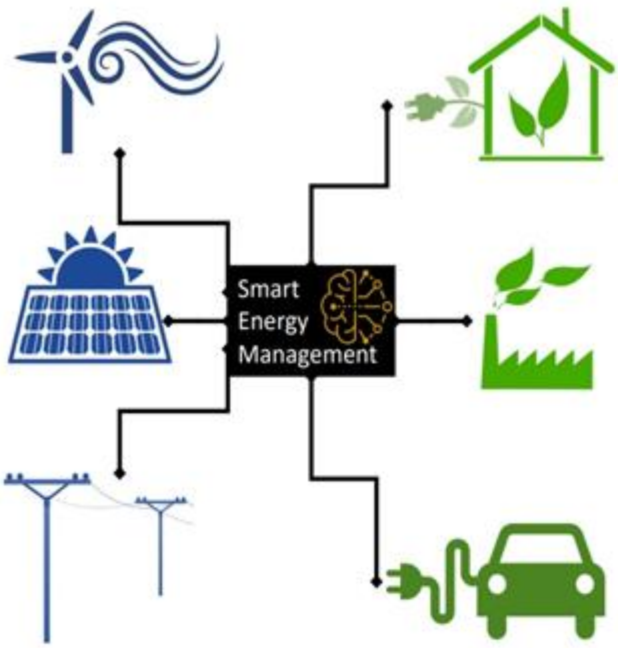

Figure 4: SEM for Sustainable Energy andGreen Smart Environments.

By using Cloud, Edge, or Fog technologies or even a combination of them Blockchain can be installed in the architecture of a smart environment in which the congestion of data can be managed in a dynamic smart way through the use of AI-powered SDN traffic control. Apart from this, sensor data can be sold securely and also provide an effective price by AI-powered SDN. On top of that, BlockchainDB securely resides private data by using different encryption and security measures that can be retrieved by authentic users.

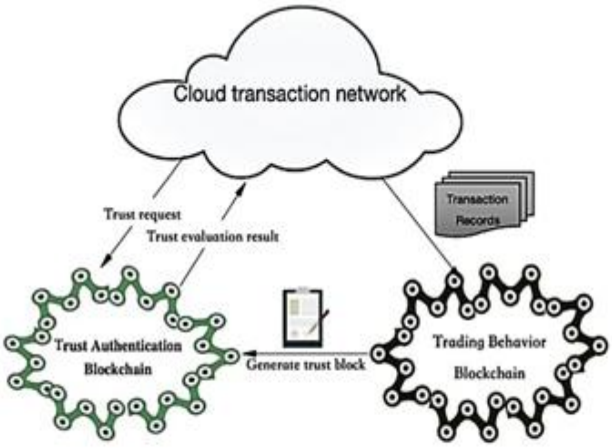

Figure 5: Architecture of Smart Environments

5.2 Mining

Every Blockchain DB can perform mining in our proposed mining algorithm. In the framework of the proposed model, the process of the next block mining is as follows: –

- In order to sort the list of BlockchainDB by uploading sensor data in decreasing order;
- According to the sorting list, avoid such BlockchainDB that is used to mine the previous block; and
- Then the first next BlockchainDBin the list is used to mine the next coming block.

To achieve the objective of this paper i.e., for saving the energy consumption, the else BlockchainDB does not endeavor to mine a block. Consider an AI-powered SDN network that has several BlockchainDBs that migrate requests and VMs by executing the *Smart Contract*. The smart contracts stored in each BlockchainDB that has the lowest load can be designed as the proposed ***Algorithm – Access Service Trust Contract*** that needs no centralized controller.

The *Smart Contract* executes on the BlockchainDB whenever a block is acknowledged by a BlockchainDB and examines all transactions that the block contains. A transaction alike request migration to the BlockchainDB is when executes in the particular block recognized by the *Smart Contract that* migrates the migrated requests which has the lowest load to the Blockchain DB.

In order to get access to the fog controller while saving network resources, upon the end of the discovery process, proceed to the selection of a minimum number of gateways. Those gateways are selected based on trust authentication. The proposed model based on a double-Blockchain structure is illustrated below to improve the integrity and efficiency of transactions of blocks of BlockchainDBs through the trust certificate of the Smart Contract. With the benefits of the double-Blockchain structure TAB + TBB mutual supervision provides a higher level of security.

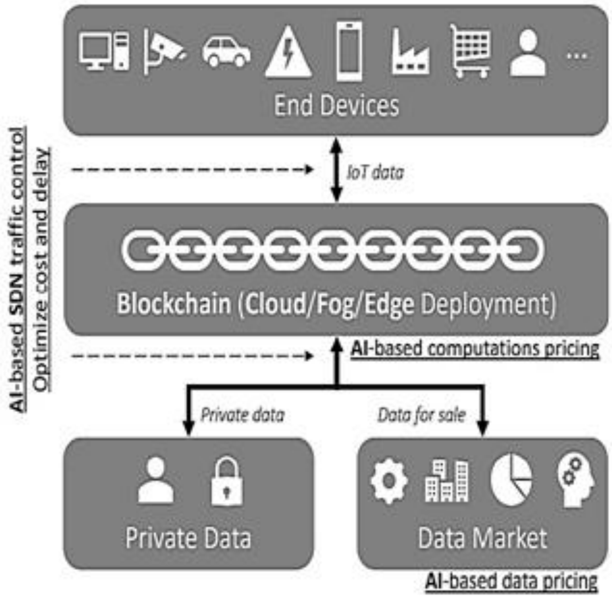

Figure 6: Proposed model based on a double-Blockchain structure

The *Smart Contract* mainly encapsulates various script codes and algorithmic mechanisms. The fog controller keeps track of all notifications received and is in charge of computing and updating the General Trust Score (GTS) for all transactions based on reports received from gateways. We introduce Identity and Credibility Service (ICS) in our proposed method that supplies the ICS personally identifiable information (PII), such as first name, last name, address, etc., and subsequently generates a pseudonymous Blockchain ID (UID) to uniquely identify the miner's account.

5.3 Algorithm –Access Service Trust Contract

1: task Determining trustful nodes in the network
2: upon True do
{The contract is waiting to be triggered}
3: function ASTC(UID_{user}, $UID_{network}$)
sender ← UID_{user}
receiver ← $UID_{network}$
4: for all $t \in T$ do
$GTS(t) \leftarrow \alpha.sender(t) + (1 - \alpha).receiver(t), \alpha \in [0,1]$
{Computes the GTS of transaction t}
5: if threshold $\leq GTS(t) \leq 1$ then
Trust(t) ← True
6: else
Trust(t) ← False

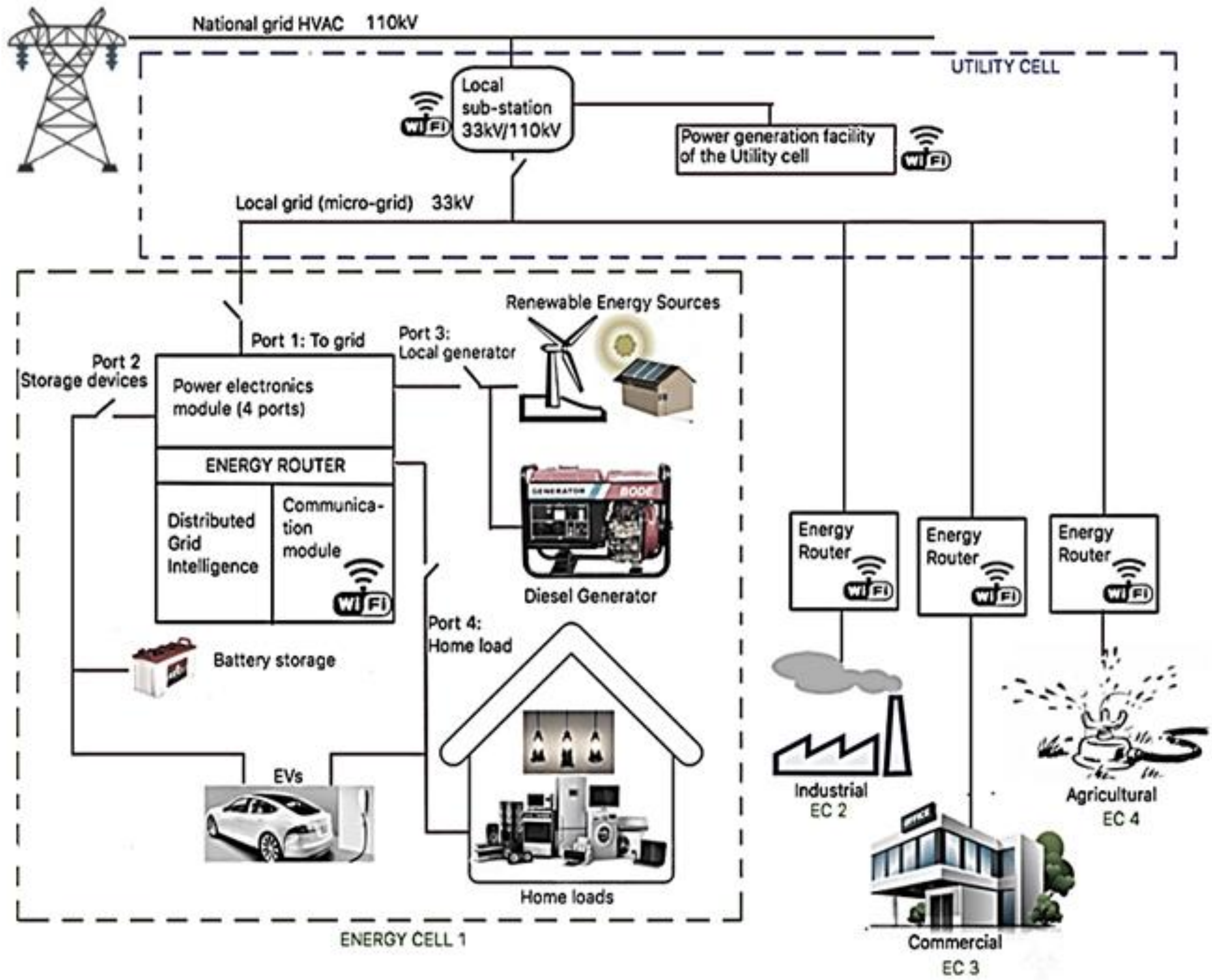

Figure 7: Proposed model's Architecture for Smart Home

For example, Smart Home based on Blockchain technology with proposed *Smart Contracts* can be adapted for a *Greenhouse*. The network model of the Blockchain-based *Greenhouse*is composed of the following components: – transactions, local Blockchain, *Greenhouse* miner, and local storage. The adaptation of a Blockchain-based *Greenhouse* is summarized in the following steps: –

- Step 1: Greenhouse miner generates a key with an End Device;
- Step 2: Greenhouse miner shares the key and stores it in the genesis transaction;
- Step 3: Greenhouse miner defines the policy header and adds it to the first block;
- Step 4: Each End Device inside the Greenhouse communicates with another internal device using the permission from the miner;
- Step 5: Each End Device inside the Greenhouse can store data on the cloud storage using permission from the miner;
- Step 6: Software-Defined Networking (SDN) connection is used to route the packets to the shared miner.
- Figure 7 shows the layout of the energy cells "Smart Home" at various levels. The new power distribution system discussed here is different from the legacy power distribution system in terms of energy delivery mechanism. The dotted box represents the participants, the green box denotes the energy cell and the blue box indicates the utility cell.

6. Conclusion

A lot of work is still needed to allow for smoother integration between Blockchain and Cloud technologies to create smarter things. Despite this, this paper presents an algorithm designed for trading energy saving for sustainable development, implemented via a Blockchain-based cloud mining system. Unlike the conventional energy-saving trading system, this system provides a distributed, secure, automated, and transparent trading system between different users using Blockchain technology.

Despite this, currently addressed challenges still remain in the vicinity of the technology itself much like standardization, scalability, performance, cost, and complexity. To examine the use of Blockchain, there are plenty of pilot projects in the scope of energy-related projects even now operating. Accordingly, the best time is now to sift the technology and assess how Blockchain could be valuable for the energy efficiency sector and to abundantly explore the challenges that occur before its commercial use.

The cognition of smart environments requires a considerable amount of job, hence in this paper, we emphasize in what way Blockchain implements smart environments with security, cost-effective scalability, privacy, and other features. The conclusion of this research points out that Blockchain can deliver what for smart environments.

Despite the merits of Blockchain technology, there are a few challenges. It is believed that the integration of the Cloud with Blockchain can mitigate challenges such as scalability, energy consumption, and infrastructure requirements and also enhance the development and deployment of decentralized applications.

For the proposed model, physical deployment is required because simulation results alone are insufficient to demonstrate the performance and issues.

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