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Augmentation of Blockchain and 5G in Green Computing

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Abstract: ***Green Computing (GC) is a step toward environmental sustainability. More precisely, it is entirely about utilizing power on the way to carry out processes in the maximum green manner. With increasing energy costs & rising ecological apprehensions, green computing is getting additional consideration. The Blockchain (BC) has emerged as a favourable implementation for decentralized, Peer-to-Peer (P2P) transparent ledger systems. 5G is the latest development in an exceedingly wireless communication network. The flexibility of 5G with BC allows many applications to become fast, clear, significant & harmless for transmission of data in this smart era. Both technologies can give green solutions to the environment. In this very research paper, convergence of BC and 5G is and integrating it with Green Computing Approaches is shown via proposed model. With use of Network Slicing approach of 5G and Sharding approach of BC, their significance in decreasing computational power and energy usage is shown. Also, major focus is on the "Green Use" approach of green computing. A hypothetical model is proposed by converging Blockchain and Fifth Generation with Green Computing. Objective is on the physical hardware services layer of green computing which will directly impact physical environment in order to give eco-friendly solutions to sustainable projects.***

Keywords: Green Computing (GC), Blockchain (BC), Sharding, 5G, Network Slicing, P2P

I. INTRODUCTION

Fifth Generation applications had various necessities in relations of latency, speed, and bandwidth of gadgets that are rechargeable. 5G networks can construct a couple of bands alike a low band, high band, and mid-band with a wavelength spectrum. 5G provides the best transmission rate at nearly 20 GB/sec that offers countless interconnections with less latency. For reliable & rapid communication, self-directed automobiles and several other smart devices are being used in Augmented Reality. To justify this dilemma, BC must be joined. Blockchain as a decentralized method equipped a protected allocation of information, data & resources amongst 5G extents.

Transaction information can be effortlessly accomplished via a Peer-to-Peer network:

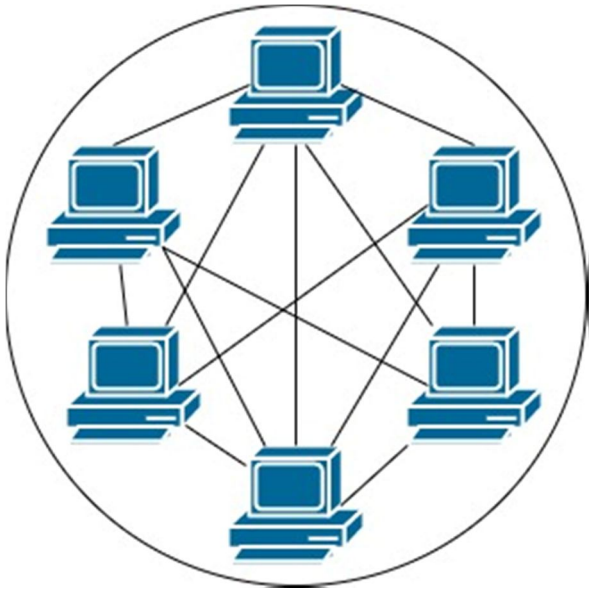

Fig 1: Peer-to-peer Network

BC control green and rapid over unsure networks than 5G. Blockchain isn't best added to conquer the safety troubles however additionally allows for the quicker distribution of actual-time data.

Green Computing is so powerful that it can keep up to (15-200%) of energy. Green computing represents various modules of wireless communication. GC is a vital characteristic in the context of 5G structures as strength intake from ICT (Information& Communication Technology) elements is anticipated to develop insignificantly via means in 2030. 5G guarantees high-quality of service (QOS) while BC assumes an excessive stage of security & accept as true by many of the peers.

With the help of the Network slicing approach of 5G, we can easily achieve smart vehicles where a user can easily manage the consumption of the network according to the needs which will directly lead to cost-effectiveness, and also it would be an eco-friendly approach.

Peer-To-Peer(P2P) communication states the communication amongst two peer computers over a network.

The study of 5G approaches with green Blockchain classifies several problems like energy consumption and trust concerns. The aforementioned strategies discussed in this paper could be used to surmount energy issues in diverse circumstances.

With increasing energy charges & rising conservational apprehensions, green computing is gathering additional consideration. In terms of concurrency patterns, software architectures play a vital role in both computation and telecommunication systems.

Green Computing is an approach to designing, manufacturing, utilizing, and disposing of computational devices in a means that diminishes their perilous effect on the environment. It is generally used to encourage energy efficiency in diverse applications. GC benefits in using the minimum amount of computing resources to complete the utmost work. GC diminishes the use of perilous materials, surges energy efficiency, and manages power. GC is all about utilizing energy to achieve operations in the most effective way possible.

Green Computing Eco-Friendly approaches are Green Design, Green Awareness, Green Usage, Green Manufacturing, Green Standards, and Green Disposal.

To fulfill requirements like low latency, high (QOS), and huge connectivity new evolving technologies such as MEC (Multi Edge Computing), NFV (Network Function Virtualization), and SDN (Software Defined Networks) are being installed. Additionally, after connecting many varied devices & technologies will directly lead to increase numerous security apprehensions regarding consumer's secrecy & concealment. To function impeccably & steadily 5G networks must install smarter & extra effective security functions for future.

Inspired via the above-mentioned issues, BC has been anticipated in this paper to surmount issues like immutability and transparency in 5G. We have proposed a 5G and BC convergence model which will include 5G techniques like Multi-Access Edge Computing, and Network slicing.

To provide consistent resource allocation and protected storage blockchain must be merged with 5G. Consequently, BC through its intrinsic characteristics will be delivering vast communication in a dispersed environment at the same time as guaranteeing extreme safety, information secrecy & trustworthiness.

Therefore, BC amalgamation including 5G networks will provide outcome like securing, maintaining & managing networks by its own, deprived of the need for a third party. 5G is probable to deliver a association for a huge amount of gadgets with amenities & resources. Herein, the objective is to create a model by converging 5G and Blockchain and further integrating it with the "Green Use" approach of Green computing. The aim is to find out if there is some sort of way to get green solutions using the aforementioned technologies.

II. BACKGROUND

A. Blockchain

Blockchain (BC) is a allocated record that preserves an uninterruptedly increasing set of information archives termed as "blocks". This decentralized technology confirms protected data transmission exclusive of the intrusion of a 3rd centralized party or any central power. Each block consists of a group of transactions devoted via way of means of contributors to the blockchain. A transaction might comprise technical metadata (timestamp, transaction id). To apprise a latest block toward the chain, all entities need to attain an contract, that is termed as BC consensus. When a novel block is authorized and appended to the chain as soon as the consensus is determined amongst every associates.

Single Point of Failure (SPOF) and being decentralized are some of the characteristics of Blockchain. A vital replica of the ledger is associated with each individual of the chain which means information is kept in a P2P setting. Blockchain is intended to be immutable means as soon as "block" is augmented, even a little change in the block would remain tremendously hard. The digital sign, and the timestamp, hash function are some of the technologies lead by blockchain.

When a mischievous user wishes for extruding in a block, this will affect the hash to modify also, which intends that user desires for attaining pristine agreement for current one & other blocks succeeding the same. The ledger can't be regulated or operated by a central being that states that it has no "Single point of failure" because of the dispersed and public characteristic of BC.

Blockchain networks can be categorized in 3 main categories: consortium, private & public BC. Permissionless blockchain where all members can be the part of a network is termed is public BC. Public BC extensively accessible for associates to write, read, and authenticate an operation deprived of the agreement of 3rd authorities. While in Private BC, individual private members can contribute to the system.

Blocks in blockchain are connected together with the help of Hash. The hash is determined by the novel transaction & the former transactions. To authenticate an operation, miners need a 'digital sign' to verify the legitimacy & truthfulness. (The BC uses the "Elliptic Curve Digital Signature Algorithm").

The system of nodes authorizes the operation & A confirmed transact. can comprise "cryptocurrency, records, constructs, or other information" (any kind). When user desires for a transaction with any form of meta data, the demanded transaction is transmitted to a P2P network comprising of computers known as "nodes".

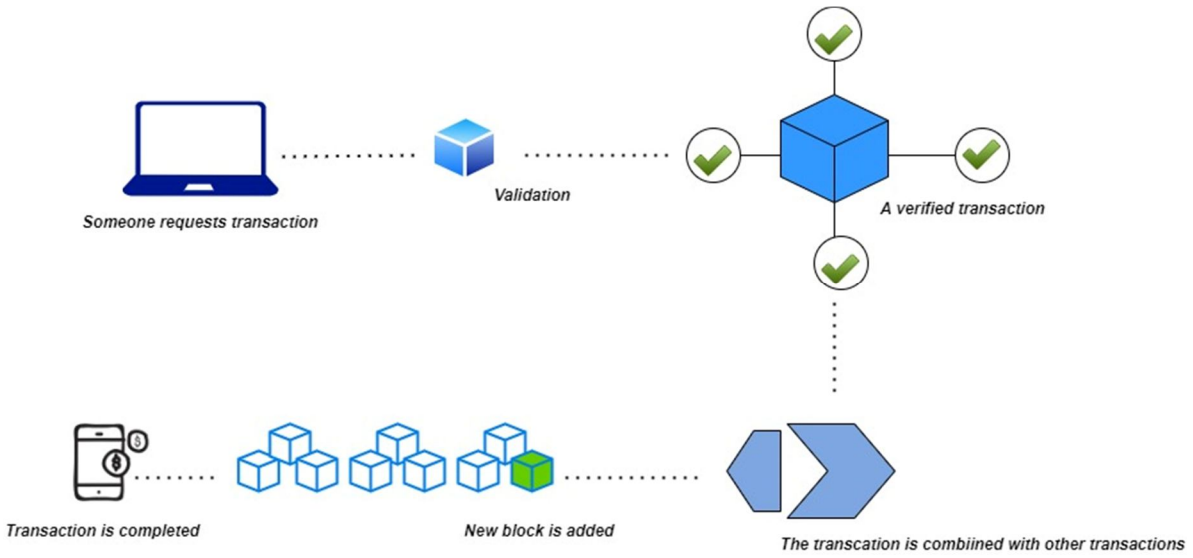

Fig 2: Blockchain Workflow

As soon as confirmed, the novel block is then appended to the active block, in a means which is perpetual & unalterable. After all these steps, the transaction is completed. A block contains metadata like timestamp, user id, transaction id, user sign, Markle root, nonce, and previous hash.

Two main blockchain approaches discussed in this paper:

1) *Blockchain Sharding:* Sharding comprises of separating huge compilation of transactions around numerous servers, allowing the distributed administration of the collection, thus refining the scalability. BC sharding discusses the imitation or artificial partition of the transaction advancement in a sole shard, with Sharding method 1 single operation can be authorized & kept via countless associates functioning at parallelism.
2) *Blockchain Oracle:* BC cannot retrieve peripheral information. At this point, the BC oracle interferes. Oracle is a "service provider (trusted third party)" which authenticates the information validity & confirms evidences in an exertion for carrying external information to the Blockchain.

Ways BC can help the environment:

- *Energy:* Increasing efficacy with P2P electric networks improves access to power in areas with deficiency or natural disasters.
- *Recycling:* Encourage recycling by delivering a tokenized reward. Track & appraise the efficiency of recycling plans.
- *Supply chains:* Track products from source to hoard shelf to decrease carbon footprint & non eco-friendly practices.

B. 5G (Fifth Generation)

5G Technology is now the contemporary mobile generation with the intention to significantly grow the velocity of wireless connections among different things. The information rate for wireless networks using 5G, would be roughly 20 Gbps. 5G will offer extra bandwidth & progressive technology which will develop ample amount of data broadcasted over radio arrangements. 5G also provides several network management capabilities such as Network Slicing using which cellular operations will be able to establish multiple virtual networks using a single 5G network. For example: If a person is inside a self-driving car, then a virtual network with extremely fast, low latency connections would be required because obviously, the car needs to navigate in real-time. On the other hand, if a person is using any electrical device, then a virtual network with low power and a slower connection would be fine. This is how network slicing works.

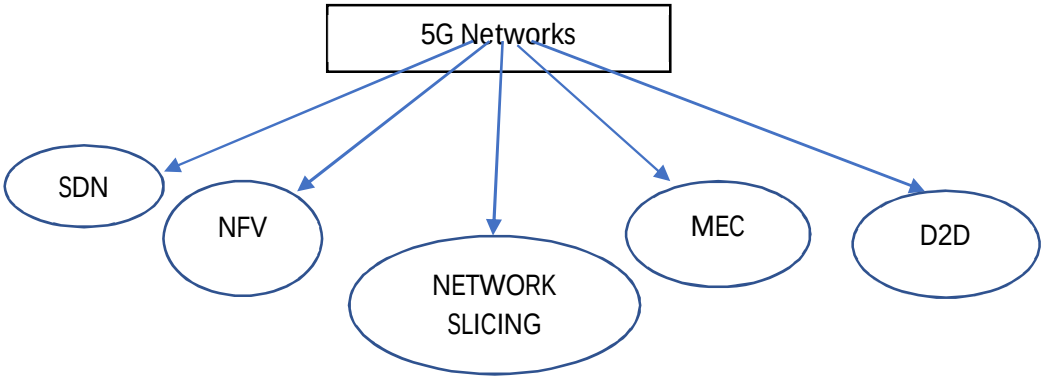

Fig 3: 5G Approaches

C. 5G Approaches Discussed in this Paper

1) *(SDN) Software-Defined Networking:* It permits peripheral controller of information from network hardware - software denoted by means of the regulator. In order to deliver intelligent networks, packet flow are controlled by controllers. Consumers will present novel facilities and able to achieve network apparatus using software by the use of regulator. Architecture of SDN approved it to be impeccable for the energetic bandwidth with high flexibility.
2) *(NFV) Network Function Virtualization:* NFV discusses substitute of computer hardware setup via way of means of software virtualization and for distinct network purposes (e.g., Virtual Private Network, switches, firewall, routers). Network functions are dissociated from physical setup & authorizes it be able to run on a cloud infrastructure virtually.
3) *Network Slicing:* Over a single physical network setup, numerous networks functions virtually. To gather the necessities demanded each system slice is detached from the physical set of connections. Incorporating network slicing with network function virtualization will permit several requests to be installed for consumers. Subsequently, to present a "high (QoS)" accommodating for consumers, services or applications should be directed over a network slice.
4) *(MEC) Multi-Access Edge Computing:* MEC diminishes congestion of network & therefore attains quicker reply. Allows computational proficiencies of the network edge cloud which permits information to be administered nearby appliances & consumers. Moreover, MEC lessens energy required to process information and storage space by allowing the computing nearby. MEC-enabled applications, facilities, and processes are nearer to the consumers which augment the QoS for users.
5) *Device to Device (D2D):* D2D communication allows 2 devices nearby to each other to interconnect by means of a conventional connection. This idea generates multi-hop relays amongst numerous appliances which upsurge the information frequency& enrich QoS (Quality of Service).

D. Green Computing

Green Computing is the research & exercise of using computing resources proficiently. We can reduce overall power consumption by the use of green computing.

Goals of green computing:

1) Implementing Technology that Reduces the use of hazardous material.
2) Avoiding hard copies.
3) Lowering resource and energy consumption during hardware manufacturing.
4) Maximize energy efficiency.
5) Promote Recyclability.

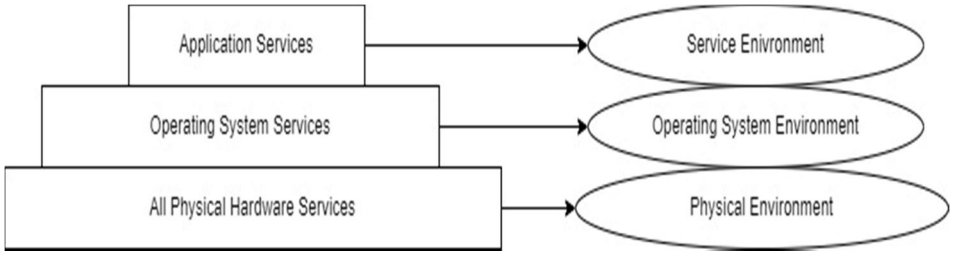

Fig 4: Layers of Green Computing

All Physical Hardware Services focuses on green computing by optimizing O.S and scheduling Hardware resources. The green computing architecture for optimized O.S enables computer power management features in OS for various techniques like Virtualization, Terminal Servers, Shared memory, etc.
Operating system services focus on minimizing the no. of system services to reduce energy consumption. Resource allocation and energy saving are key resources. In Application Services, Client application virtualization such as Microsoft Application virtualization can be used to reduce the number of resources used by clients in order to run a fully installed application & architect.
Techniques to make Green Computing feasible are Nano data centres, Virtualization, and Dynamic Voltage. In this research paper, we focused on the Virtualization technique of green computing by replacing hardware devices.

Table 1: Blockchain & its Potential to 5G:

Characteristic	Decentralization	Immutability	Transparency	Security& Privacy
Description	No central authority is needed to perform any kind of transaction.	Difficult to alter information verified in the blockchain.	Each info on the blockchain can be accessible to all network members.	Employees asymmetric cryptography for security with high authentication.
Potential application	Eradicates single-point failures, and certifies data accessibility.	Significant human-centric interconnections can be accomplished via p2p networks of omnipresent BC nodes without actuality altered.	Present transparent ledger explanations for really public 5G architectures (i.e Decentralized network virtualization)	Deliver high protection for 5g Systems confronted in decentralized ledgers.

III. LITERATURE REVIEW

A. Case Study 1: "5Green: Towards Green 5G Mobile Networks":

This manuscript discusses major challenge of assembly forthcoming requirements & opportunities for mobile networks in a supportable & efficient manner, they specify an explanation over low power consumption and efficiency. Currently, the mobile energy bill, where we look at major energy challenge, is an increasing part of their functioning costs & telecommunications needs in the forthcoming, costs will rise at a disturbing rate. Correctly implemented, this is likewise a great idea for the global economy, reducing the percentage of CO2 gas emissions associated with the "METIS" project partners reflecting telecom vendor views, tertiary institutions, and mobile work vision, the paper said to be a highly focused company. in the active capacity of the 5G transportable web and resolve improve in the design and construction of low-power plans, due to the fact that this paper highlights key areas in the design of low-performance 5G mobile network, pointed out major challenges and outlined possible solutions. Many devices are connected to a 5G network with a wide range of features that include requirements, part of which will vary significantly, some may require small latency, some may necessitate high trustworthiness, low reliability, and some may yield a high number of information, currently some very minute to send.

The design of a mobile device has a profound effect on how energy efficient the system should be. An energy saving device requires a person to be able to save energy, while the information is transmitted and when the system is in idle mode. While system is popular idle mode transfer of access to statistics, papering, and idle mode needs to continue. The addition of low power consumption by network delivery techniques has been reviewed in many modern technology applications. The development of various public distribution strategies that use a limited range of distribution resources and locations will provide the ability to record where existing milestones were actually sought and can bring optimal use from introduced delays built in the form of new buildings. It will be noted that the future network will consider day in and day out in order to effectively reduce energy consumption and is now less efficient considering the fullest hours.

B. Case Study 2: "Sustainable Green 5G Networks":

This exemplary reading analyses the newest research on 5G system raw materials &the gathering power of 'green' connectivity that seeks solutions to meet the demand, because three ideas have emerged, these technological advances develop out of a different perspective.

1) Reduce (transmitter-receiver) and increase the rate of reuse in machine communication over very dense networks and machine.

2) Using an 'sedentary and unregistered rate band' in an unauthorized range for millimetre-wave interactions and long-term evolution.

3) Improve visual performance by using a large number of sticks. All of the above innovative ideas are exhausting, which can be important in building 5G energy-saving networks, in which case low power consumption may no longer work. With this lightweight, a novel matrix number of wireless transmission system, nowadays adopted by the green proposal metrics recognized as energy productivity and is evaluated in bits per volume. Here the interim, it should also remain renowned that energy effectiveness cannot be improved by utilizing the best green spectral technology in wireless communication due to obstacles created using Shannon's reliable and unobtrusive power. Energy-saving enhancements can effectively reduce the power consumption problem into a reliable volume and do not always suffice for a stable 5G connection and distributes mobile responses to various machineries of wireless communication links. Therefore, the importance of participating electricity harvesting into radiocommunication networks cannot be emphasized. The 5G offering offers the opportunity for launch, low-tech gadgets and affordable gadgets that create a space for technological innovation and agency. While providing community-based responses designed to assist specific markets including non-motorized vehicles, smart grids, smart and agricultural homes, and health care. In addition, it is very important to speed up the network company's financing for all the events involved. This is exactly what help is needed for many types of direct productions and makes their arrangements so that you need novel progressive facilities for dispensation and broadcast of facts.

IV. WORKFLOW

1) *Research Approach:* The research is waylaid via a qualitative background which means that non-numerical data will be collected in order to sense the research topic. Qualitative research is also focused on collecting experiences, opinions & ideas related to the topic.

2) *Data collection:* The prime basis of data compilation intended for this research paper is secondary which means that published literature on the topic will be studied. The published literature will be academic work that has been conducted all over the world by different academics and scholars also survey data is used for achieving solutions and creating a model.

A. Survey

Table 2:

Villages survey	EVM machines waste	Local banks with hardware waste	e-wastage	High charges of using network facilities(3g,4g)
Village 1	30%	32%	45%	45%
Village 2	25%	22%	53%	34%
Village 3	27%	24%	55%	39%

We did a survey in 3 Villages, where we found that EVM machines that are not in use are in huge numbers. Harmful practices such as the defacing of EVM property during the poll campaign and curbing the use of plastic and other environmentally hazardous materials. Current voting systems like EVM undergo from several security dangers such as DDoS attacks, vote modification, data manipulation, etc, and also necessitate a enormous amount of paperwork hence less eco-friendly and time-consuming.

Security breaches like data leaks and vote tampering are common in villages. The difficulty of differently-abled voters to reach the polling booth. Using Blockchain and green computing voting process can be made more secure, immutable, transparent, and reliable.

Local banks with hardware waste are in huge numbers, there were local banks in villages with approximately 20-25 computers and other electrical devices and workers are only 2-3. Placing your computer on standby or allowing your monitor reach into sleep mode also creates energy waste, as these modes still require power. This energy waste translates into greenhouse excess gases that contribute to pollution and global climate change.

Green Cloud computing (GCA) is a way of redesigning the architecture of data centres compatible with environmental sustainability. GCA tends to provide a long-term solution to both private and public cloud-based services by removing the unsustainable part in the cloud architecture & making the services more ecologically friendly. We want Green Cloud Computing solutions that can save energy & reduce functioning costs & augment environment sustainability.

High data charges can easily be solved by switching towards 5G as with the assistance of the 5G network slicing feature, users can manage their network according to their needs.

To solve all these issues, we used GC. GC contains shrinking the environmental effect of technology. That means using fewer energy, diminishing waste, and encouraging sustainability. Green Computing targets to reduce the carbon footprint generated by the IT industry.

Some green computing approaches:

- ✓ *Green Design:* Fabricating energy-green computers, other e-devices.
- ✓ *Green Manufacturing:* Diminishing waste during the engineering of computers and different sub-systems to decrease the environmental effect of these actions.
- ✓ *Green Use:* Diminishing the energy intake of CPUs and other e-devices and utilizing them in a green means.
- ✓ *Green Disposal:* Recycling of e-gadgets.

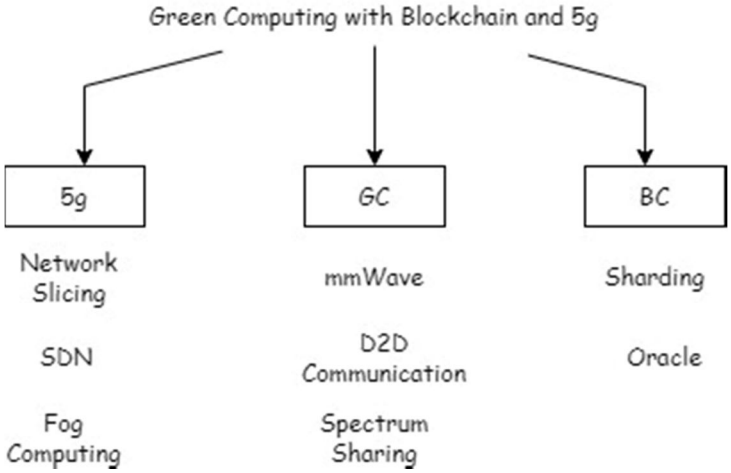

Fig 5: GC with BC and 5G approaches

V. PROPOSED MODEL

A. *Convergence of Blockchain and 5g with Green Computing*

Blockchain strategies can support 5G network to allow qualities such as translucency, decentralization and immutability. Moreover, 5G networks are exceedingly spread and demands new technologies such as, Device to Device Communication, Multi Edge Computing, Network Function Virtualization & Software Defined Networks.

This expertise is difficult to arrange & accomplish. Besides, 5G nets sharing amenities, & processes amongst numerous participants could be deceitful.

Therefore, BC will surely allow future 5G nets with a high degree of safety measures, direction, & manageableness vital amongst 5G consumers. The motive of the amalgamation of BC with 5G systems arises utmost fragment via foremost characteristics of blockchain that could resolve the disputes of 5G in associations for safety, secrecy, and translucency.

Furthermore, By using the immutable ledger of blockchain, we can secure shared services and operations. Certainly, as soon as information is added within the BC ledger, we cannot change, fabricated, BC practices a cryptographical sign and hash function to secure information. After converging BC with 5G, we could directly integrate the model to GC in order to use less computing hardware resources by using green computing's all physical hardware devices layer.

BC will advance 5G networks in provisions of access control, safety, and data secrecy. Without the requirement of a central authority BC is able to decentralize network management. The usage of blockchain-based CC (Cloud Computing), could allow the decentralization of 5G set of connections. In accumulation, blockchain can sustain to steady Device to Device communication by constructing a centralized P2P blockchain connections, that counts every device as a BC 'miner' who contains a replica of the record, validates legitimacy and observe operations to improve trustworthiness of system.

Following our presentation of merging blockchain and 5G with Green Computing, decentralization of the voting system, banks and other models like Environmental treaties can be put into this architectural model in order to get secure, trustworthy, and eco-friendly services. In this architecture, a huge number of untrustworthy users are associated through Device- to-Device communication. A reliable and scalable blockchain architecture has been proposed in this model compiled of 3 levels, which are directly integrated into the green computing's "physical hardware devices layer". Transmission and Retrieval of data is done by 5G devices comprised by the access layer. The Multi edge computing layer takes responsibility for sending packets and authenticating their legitimacy by applying a blockchain sharding and oracles.

B. Architecture

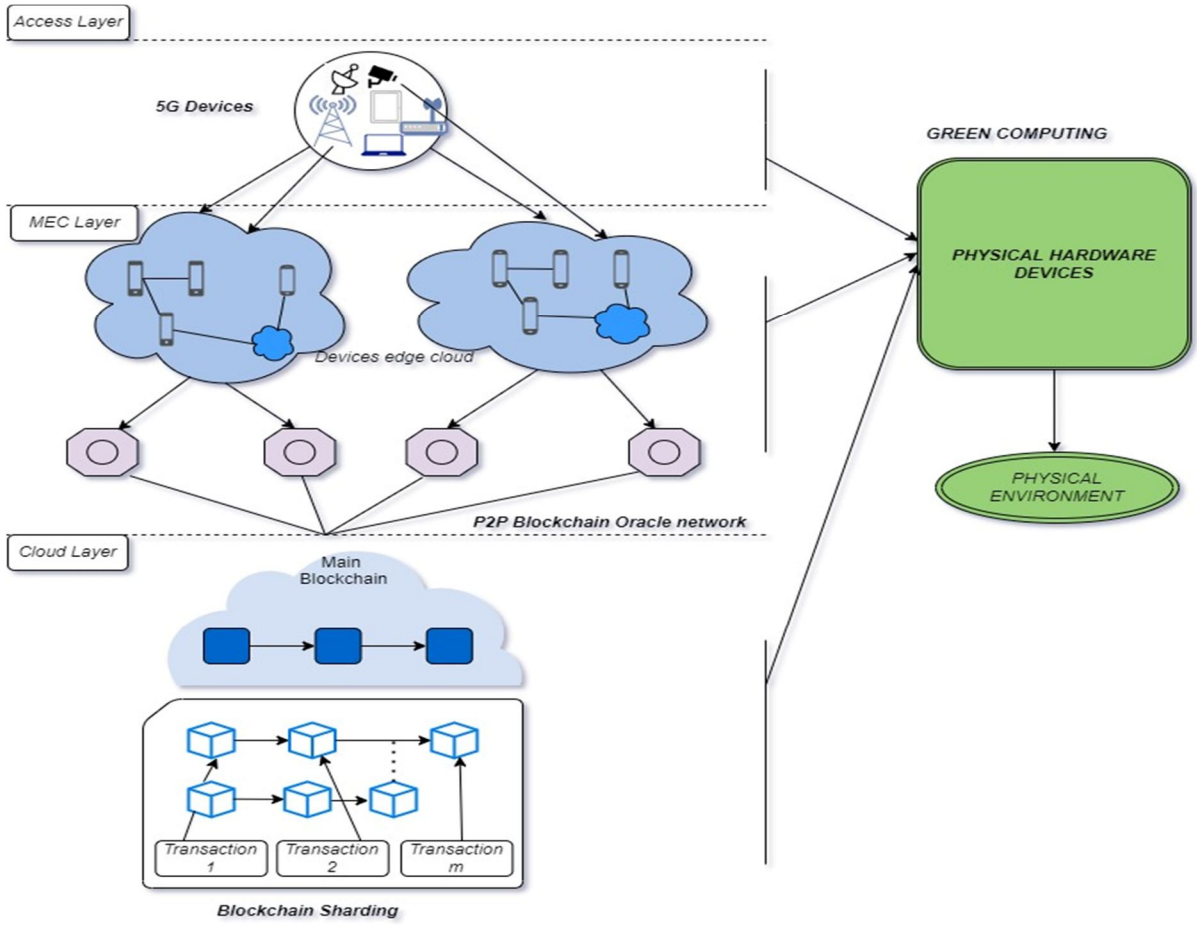

Fig 6: Convergence of Blockchain and 5G with Green Computing

In this model, a huge number of untrustworthy users are associated through Device- to-Device communication. A reliable and scalable blockchain architecture has been proposed in this model compiled of 3 levels, which are directly integrated into the green computing's "physical hardware devices layer". Transmission and Retrieval of data is done by 5G devices comprised by the access layer. The Multi edge computing layer takes responsibility for sending packets and authenticating their legitimacy by applying a blockchain sharding and oracles.

'The Cloud Layer' stores the data with scaling the blockchain even though keeping security agreements. Via use of 5G devices a user at Access Layer can easily manage his data usage by Network slicing feature, MEC layer includes devices edge to cloud with P2P Oracle network and Cloud layer represents the main blockchain with the facility of Blockchain Sharding which basically provides the feature of dividing every transaction into various shards and independently handling it.

This convergence model of 5G and Blockchain will directly establish a relation with GC's Physical Hardware services layer which will directly impact the physical environment. We can model any kind of eco-friendly project in this aforementioned model.

As 5G embraces a huge quantity of devices and consumers that interconnect at an extreme rate leads to the generation of big data which directs to scalability issues in the addition of blockchain with 5G. Blockchain Sharding was projected to attain horizontal scalability.

It comprises of partition each transaction into numerous shards and processing it individually. We proposed Blockchain sharding to achieve horizontal scalability as BC sharding comprises of sectionalization every transaction into numerous shards and managing it self-reliantly.

In this article, To validate the data requests and authorize their resource we recommend to use a (P2P) set of connections. To retrieve external information from the network blockchain oracle is used. It mediates here, it is a amenity provider (reliable 3rd party) which authenticates the legality of data.

Nevertheless, confide in a specific 3rd party might precede to presenting untruthful & erroneous information. Towards conclusion, P2P oracle network confirms legit amount of 5G data is strongly recommended. Every sensed data directed from a 5G device could be valid 'T' or invalid 'F'.

C. Design

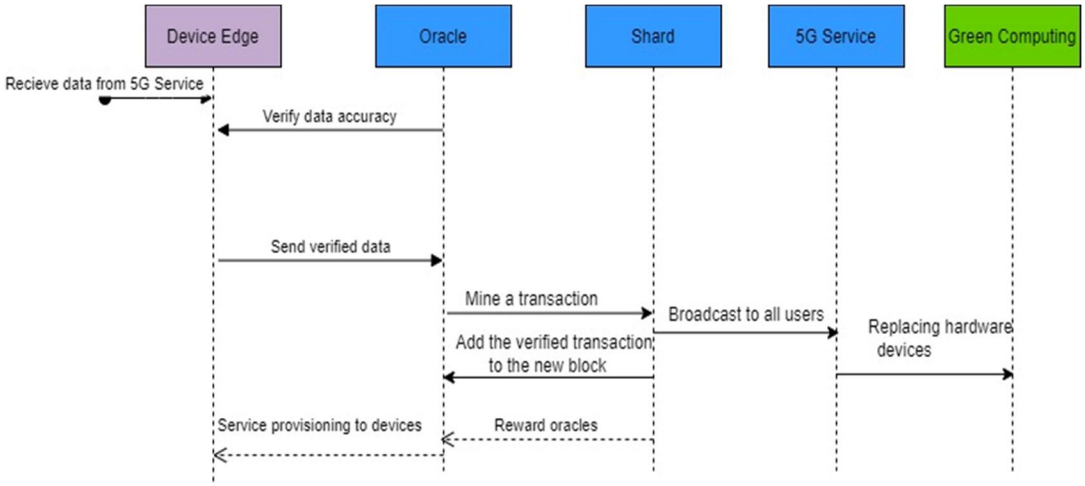

Fig 7: Sequence diagram of utilizing shards and oracles with Green Computing

This sequence diagram explains the order in which processes are executed in our proposed model. The device edge module states the data which is received from the 5G service and Oracle will first verify data accuracy and then transfer that verified data to Shard, which will further mine a transaction and add the verified transaction to the new block. Here, transaction of any kind of data is stated not just cryptocurrency. This sequence diagram explains how our model will work in real-world scenario for decentralizing any centralized process and also targeting the Physical layer hardware service of green computing. Shard will broadcast to all the users via 5G service and as our model should be eco-friendly from the start it will directly replace hardware devices with green computing. The concept of reward oracles could be used in approaches like Environmental treaties, Supply chains, and tracking mechanisms to reduce waste.

D. Working Model

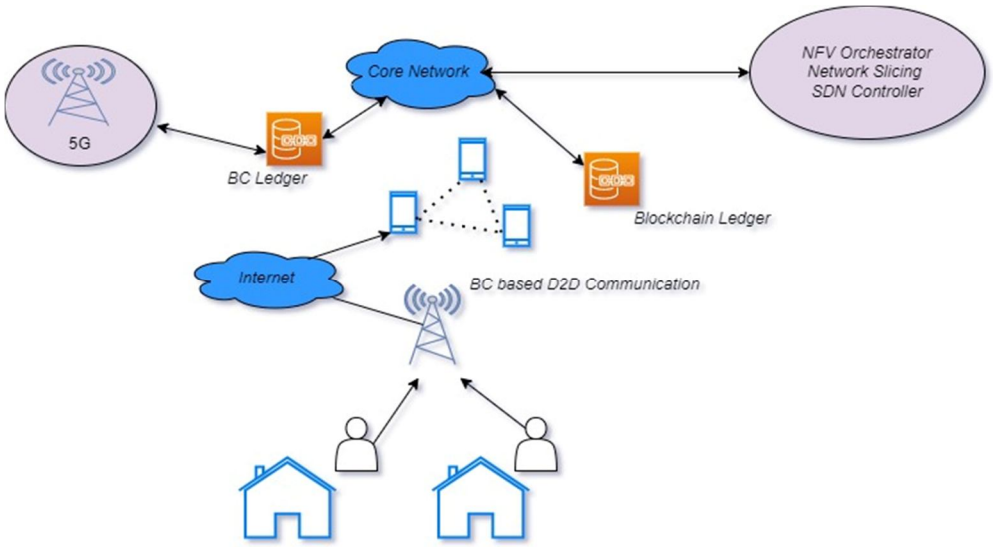

Fig 8: Real world hypothetical model for BC,5G & GC

In the above figure, two users are communicating via the Internet using BC-based D2D communication. Every data of users are stored in a Blockchain ledger, these ledgers are further connected to a core network. This core network is working on Network slicing, Network Function Virtualization, and SDN Controller. With the help of these 5G approaches, users can manage the usage of a network according to their needs. Also, with the facility of pay-as-you-go service, users can manage their network plans accordingly via using a Network slicing feature of 5G. With the help of Blockchain in the main cloud, less number of computers will be required. Also with the help of BC's security standards, the metadata of users will remain safe and private. With this convergence of Blockchain and 5G, we can reduce the use of hazardous gadgets, and using green use approach of GC helps in promoting green cloud computing.

VI. FUTURE WORK

To make the aforementioned model more scalable and secure, more studies need to be done. In, order to connect all the services of GC (including application services and operating system services) with BC and 5G more experimental work should be done to reach a strong conclusion. e-Voting and e-banking systems should be practically imposed for achieving decentralization with data security and user privacy. By considering our proposed model as a reference, Green computing approaches can be easily merged with Blockchain and 5G. Also, immutability is a factor that can work as a barrier to the scalability of blockchain as due to the immutability feature, the recorded data cannot be changed. As soon as, the information is documented in a block it cannot be altered. Some centralized processes will require some change in data at any point in time so there should be some solution to overcome this immutability feature without replacing it, as this feature also helps in securing data manipulation in case of any malicious attack.

VII. CONCLUSION

Blockchain was anticipated via numerous scholars like a resolution for 5G fundamental challenges. Blockchain was initially proposed for the cryptocurrency framework, though, this technology has pushed ahead of its domain. Certainly, various researches revealed the advantage of utilizing BC emulsions to converge the necessities of 5G networks such as unambiguousness, immutability, security, & decentralization. Green computing through its green approaches will directly impact the physical environment with help of BC and 5G. In this manuscript, we have proposed a model with blockchain integration with 5G and convergence of both with GC that can lead to a healthy environment by reducing the use of hazardous hardware devices. Our main aim was to find a solution for the physical hardware services layer of green computing by integrating it with Blockchain and 5G. Moreover, we concise some approachable questions and presents some research paths that demand broaden examination for the reliable distribution of blockchain in 5G networks with Green Computing. Other layers of green computing like Application services and Operating system services should also be examined with Blockchain for green benefits.

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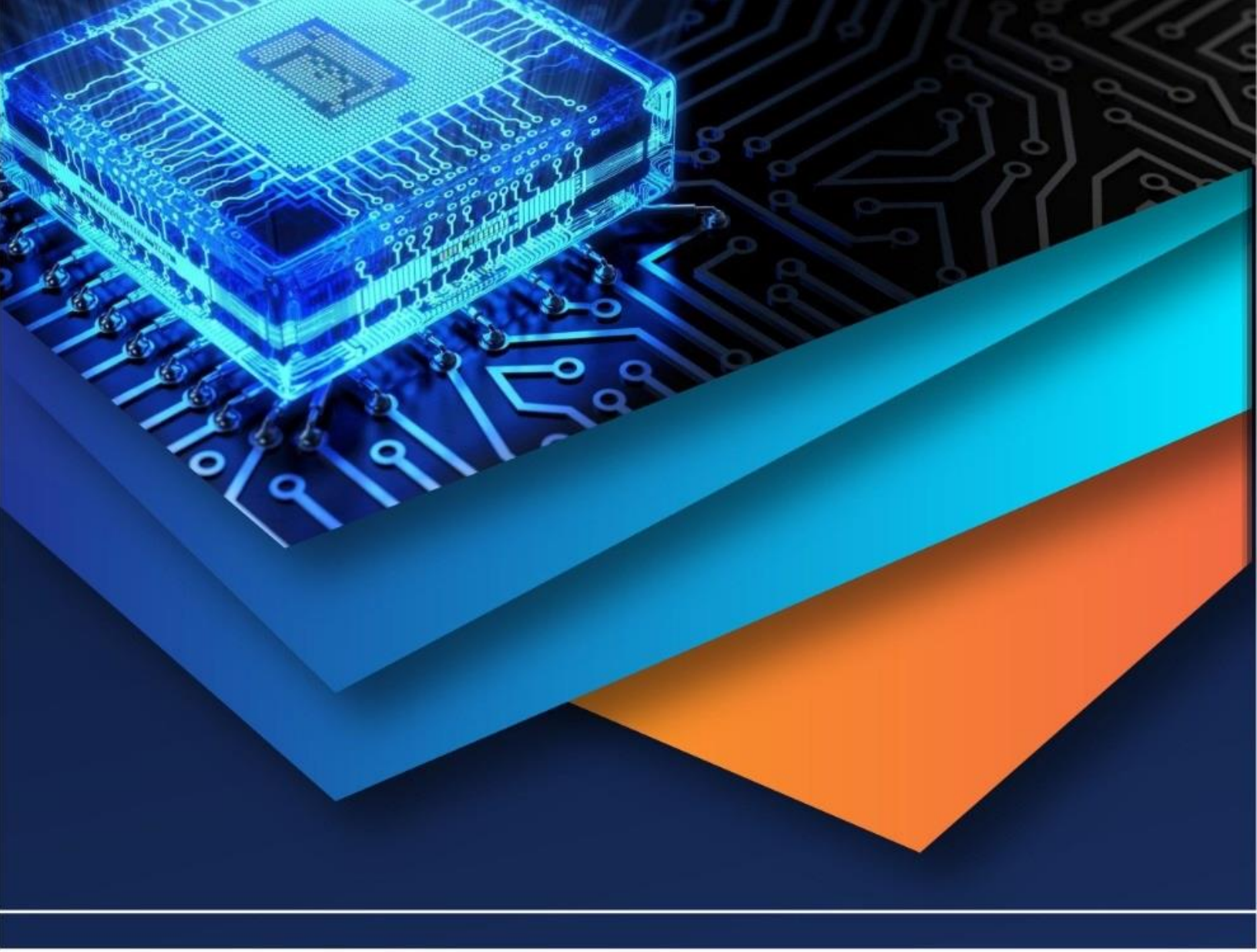

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