iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** V **Month of publication:** May 2022

DOI: https://doi.org/10.22214/ijraset.2022.43463

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

Blockchain Technology and its Use Cases

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Abstraction: ***Blockchain is a disruptive core technology that has the potential to change the internet as we know it, forever. Transactions on blockchain are completely decentralised. Although , we can say it is its very crucial property that we need over traditional second generation web aka web2.0. In this research, we had discussed about the fundamentals, working principles, and upcoming future use cases to get a stable, privacy oriented working. We explored the top articles, most productive countries, top most education sources to do evaluation on the future use cases of blockchain in day to day life. In this paper, we will get knowledge about the top most advantages of blockchain over previous technology. Architecture of blockchain like nodes & networks are also discussed in this paper. We had discussed the core principles of decentralisation, distributed database ledgers: bill book type management to store all activities & transaction, cryptography: to protect the system from unethical activities. Cryptography derived or explains the us concepts of proof of work (POW) and proof of stake (POS). These concepts increases the trust and productivity on the blockchain. We will discuss about all types of security practices like Hashing, Private keys, Consensus: inspector of modern blockchains, architecture (nodes & network) etc. At last we will discussed the future use cases of blockchain.***

Keywords: Blockchain, Decentralised web, NFT, Consensus, ledgers, bitcoin, blockchain's use cases

I. INTRODUCTION

The history of blockchain does not go back veritably far. But it does go back to the early 1990s when a brace of physicists, Stuart Haber and W Scott Stornetta, were trying to break a big problem, how to keep the past secure, and keep digital information safe and resistant to tampering? In 1991, they published the first paper to outline the use of a chain of cryptographically secured blocks to save the integrity of past information and cover it. In 1993, in response to the proliferation of spam and other network abuses, the concept of proof-of- work was established, that sought to give countermeasures to those.

It was not until 2008 that what we know moment as blockchain was established, when the world was introduced to an individual or maybe a group named Satoshi Nakamoto, the shadowy central figure within the story of Bitcoin. The paper was called Bitcoin A Peer-to- Peer Electronic Cash System. This knowledge is so common that some people suppose Bitcoin is the blockchain, and that the terms are exchangeable. They aren't. 2014, enter Ethereum. Ethereum's crucial invention is that it's much further than just a currency or a record of deals. We start with the idea of centralization. Centralization, or control by a single individual , authority or entity, is a common and pervasive form of governance. Governance refers to principles of association or organisation and power. The problems with centralization came to a head during the global fiscal crisis of 2007-2008. On October 31, 2008, in the midst of the financial crisis, Satoshi Nakamoto (an alias for a still unidentified individual or group of individualities) published the Bitcoin Whitepaper, named Bitcoin A Peer-to- Peer Electronic Cash System. Bitcoin attracted attention for its capability to allow for peer-to- peer transactions without a centralized conciliator or intermediary. Technologists were drawn to the blockchain, the underpinning element technologies on which Bitcoin operates.

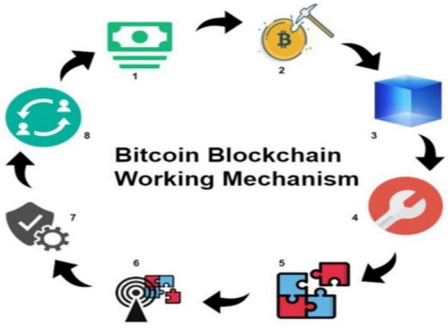


Fig. 1 how bitcoin blockchain works

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A. Problems with Current Conventional Distributed Database

1) *Authority:* Databases are controlled by the administrator and are centralized in nature. All the data coming from and going to server are the control of a single person, authority And may be government also. Issues : Data Censorship, no freedom of speech
2) *Immutability:* The database supports CRUD (Create, Read, Update and Delete). CRUD stands for Create, Read, Update, and Delete. This also means that data can be erased and replaced with new values if needed. Blockchain, on the other hand, works differently when it comes to data storage. Blockchain supports immutability, which means that data once is written cannot be erased or replaced. Immutability means that no data tampering is possible within the network. Issues : Data Breach, Cybersecurity issues, Data tempering
3) *Integrity:* Malicious actors can alter database data. Issues : Data exposing , Cybersecurity issues, malicious attacks on server & database.
4) *Transparency:* Databases are not transparent. Only the administrator decides which the public can access data. The database being an old technology is easy. Transparency ensures that the public can trust the network. Databases, on the other hand, being centralized, doesn't support any form of transparency. Users cannot verify the information if they want to. However, an administrator can make a set of data public, but still, the data verification cannot be done by an individual. Issues : No right to information , Corruption diminution

II. DECENTRALIZATION

Decentralization is basically about shifting power and authority in a community off from one central entity and making that power available to the members themselves, making community members self-autonomous. A good illustration is BitTorrent. BitTorrent is a peer-to- peer train participating protocol that does not depend on any one server, company, or entity to work. Bitcoin works in kindly the same way in that it does not necessitate a bank to act as a central arbiter between two people who want to exchange value. The protocol empowers them to do it themselves. A blockchain with 100 nodes is greatly resistant to attack because if, say, five nodes go down, the system can fluently continue operating with the other 95 remaining nodes.

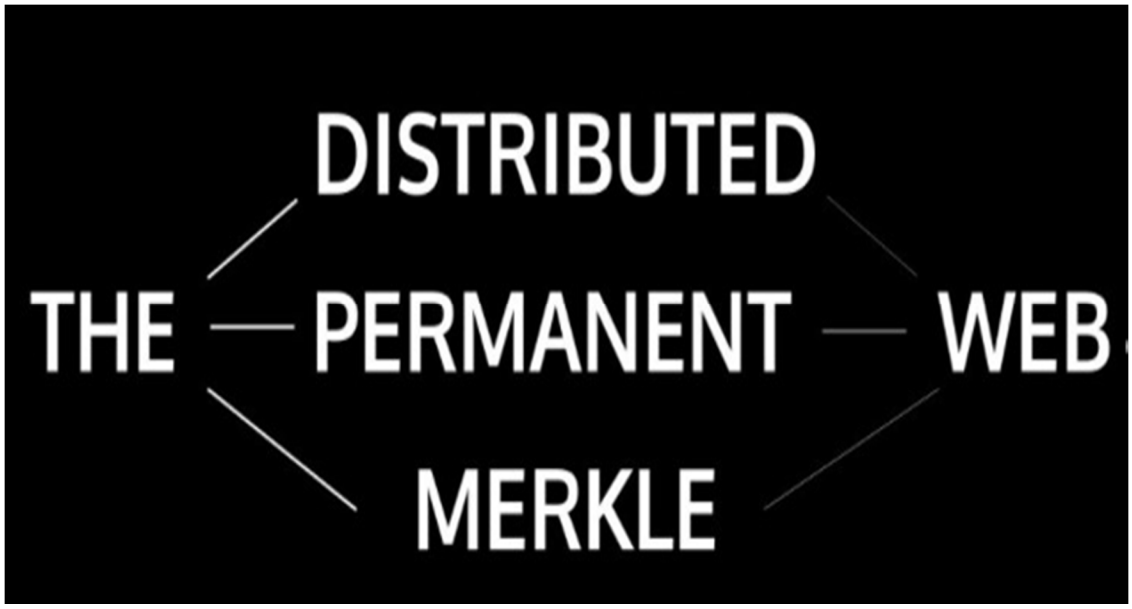


Fig . 2 properties of distributed web

A. Importance of Decentralization

Vitalik Buterin, one of the founding fathers of Ethereum, detailed the following three forms of decentralization
Architectural (de) centralization, Political (de) centralization, Logical (de) centralization
Decentralization (politically and architecturally) allows blockchains to be

1) Less likely to fail because they calculate on numerous separate components.
2) Harder to attack because the networks are spread across numerous computers.
3) Harder for users with malicious intent to take better of users who are using the platform for its willed purpose.

B. Uses of Decentralisation

1) Decentralized applications - The advance level of Applications: Most of the applications are running in centralised networks like controlled by single authority or organisation. Streaming, Social media applications are some illustration and these services having our data in a centralized servers. While this centralization is effective, it generates a huge volume of data and that means it leads to unwanted exposure to hacks, etc. As the same, these data were sold to others for make profit. So, the applications built on blockchain technology can help to reduce these issues and those applications are called ***Decentralized applications.*** Decentralized applications or ***DApps*** are applications that run on the blockchain or peer-to- peer computer rather of a single computer. The application's data and records of operation must be cryptographically stored in a public, decentralized blockchain in order to avoid any central points of failure.

*a) Features of **Dapps***

- They're decentralized they're free from control and absence of single authority.
- It's running in Blockchain nodes and there's no single point of failure.
- DApps are totally open source.
- They're more secure that Traditional or conventional App.
- They're censorship resistant.

b) DApps used for:

- Crypto wallets
- Decentralized exchanges
- Social media
- Games
- Finance

DApps look familiar on the front end, the back end exists on a decentralized database instead of a centralized server and it is built on decentralized networks, while traditional apps live on centralized networks.

III. LEDGERS

Back in the 1500s, a ledger was a large volume or service book, regularly located in one place and openly accessible. This idea evolved over time into the ledgers that we're more familiar with now as a principle Book of Accounts for a business entity. In modern usage, ledger accounting is common practice with credits and debits recorded on a businesses ledger. Digital ledgers and databases can be edited, copied and transferred with unprecedented ease from anywhere in the world. Enter the distributed ledger. To combat the weaknesses of having one ledger to rule them all.

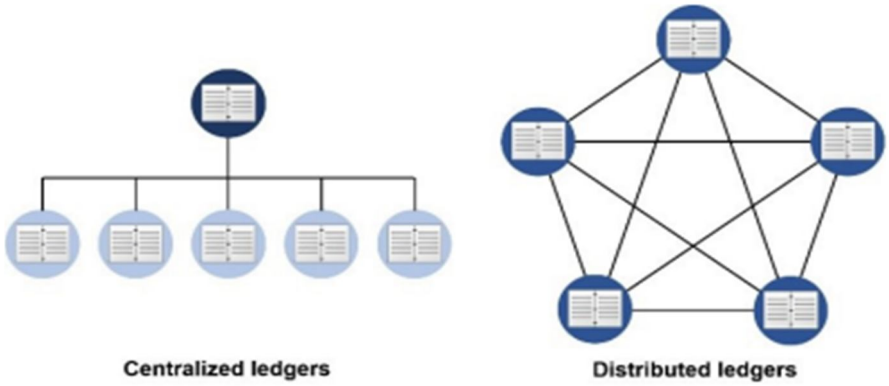


Fig . 3 Difference Between a centralized and decentralized/ distributed ledger

Ethereum which is a blockchain that can actually store data and run code. Distributed ledgers and blockchains have also introduced the idea of triple entry accounting. In the presence of an established blockchain, companies can each maintain their own business ledgers, but transactions can also be recorded on the distributed blockchain.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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IV. CONCEPTS OF CRYPTOGRAPHY

Cryptography is essential to enough much every part of cybersecurity we have. But it's actually been around for a long time. From the Greek cryptography translates to retired writing. And it's as old as the earliest dispatches we ever wrote using codes or ciphers, like this one.

A. Why do We Need?

The problem is we live in a world of unencrypted networks. On the Internet, there is always a third party handling our communications. Communicating over a public unencrypted network means that anyone along the path of the Internet traffic from point A to point B can block and read the messages if they want to. It's a lot like transferring a communication on a card in the mail. You know that the mail person can read it if they want to, anyone in the truck can read it, or anyone at the processing facility. So the question becomes, is there a way for we can send a communication over the same public unencrypted network but still insure receiver the only one who can read it? There is, it's called public-key cryptography. Public key A is used to encrypt or perhaps lock messages and private key A is decrypts messages but only if they were encrypted with the matching public key A. The public key is called that because it can be participated openly. Public key A can encrypt a communication but not decrypt a message that it encrypted. That's it can not unleash a message that it locked. So it does not matter who else on the network might have it.

1) *Hash Function:* A blockchain uses hash functions in order to produce a record of the data recorded to the blockchain so any change to a single piece of data is fluently linked. How does a hash function do this? A hash function is a digital mechanism that's used to compress data into a specific format of a specific length. The hashing algorithm used by the Bitcoin blockchain is SHA-256, which stands for Secure Hashing Algorithm, with a hash length of 256 bits.
2) *Public Key Cryptography:* Public key cryptography is also used for what is called digital signing. It's through subscribing that a blockchain knows that you, and not someone other , initiated a transaction. To do that, the process for public key cryptography that we talked about previously is basically reversed. A digital signature is generally the mathematical mechanism for basically combining a public sequence of figures with a given digital message, and you can really suppose of a digital signature in numerous ways as the electronic analog of a physical signature. In a physical signature, you will generally fix, let's say, a sequence of characters representing your name or identity to a document. This process effectively binds your identity to that document and more so by formulating the characters in your name, and perhaps some particular to unique or peculiar way that is unique to you. The hope is that nothing will be suitable to forge your name on that document.
3) *Anatomy of Block:* Bitcoin blocks on the other hand contains nearly up to transactions per block, but this number varies between different blockchains and depends on block size limits. Block sizes are generally limited in order to help network congestion. Bitcoin presently has a block size limit of one megabyte. Every block has a unique number, also called its height. Since the blockchain is direct, these figures again or heights increment. There can be only one block at a given height. Blocks also contain a timestamp, a strange number called a nonce, some other information not listed then and critically a hash of the former block in the chain. Chain of Blocks, The critical part of including a block into a blockchain is the inclusion of a cryptographic hash of the former block. In this way, blocks are linked all the way back to the veritably first birth block and are vindicated by hashes. Because each block contains the former hash and that gets minced within the coming block, in a sense, all the former hashes are ignited into all unborn block hashes.

V. NODES AND NETWORKS

Nodes are the computers that make up a blockchain network. Traditionally, the Internet has been server- grounded structured with a server in the middle and clients all connected to it, something like what you see then. In this architecture, anyone who wants to interact with an online service connects to the same server.

Drawbacks -- There are a couple of big drawbacks here.

First, the bandwidth demands on that server are very high since all traffic goes to and from it. All of the pathways that live for data between the networks participators go unused then.

Second, there's a single point of failure .However, the system will cease to serve and there is clearly a attention of power then, If the garçon crashes or gets addressed. Whomever controls the server controls the system which is not inescapably a bad thing but it's a note in this model to take note of.

Nodes are the gateway to and the stewards of the blockchain. They're the systems that communicate with one another, ensure the validity of the blockchain, and store local copies of it.

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VI. CONSENSUS: THE INSPECTOR IN BLOCKCHAIN

We have learned a little bit about how nodes agree on things, the sheer amount of effort needed to produce a valid block by mining a hash is what's used by nodes to agree on what makes a block valid. This is what proof of work is, a valid block is itself evidence of a lot of work which shows your commitment to the system. So, when we talk about trust frameworks and consensus mechanisms.

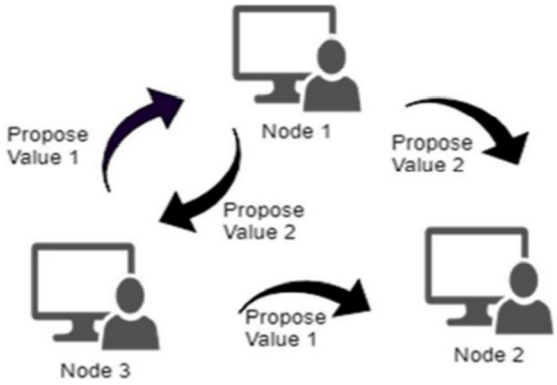


Fig.4 Consensus Model

There's also a protection against attack because anyone attacking the network would also have to hold a great deal of capital in the network, which would make such an attack self-defeating. One problem with proof of stake is that individualities with small balances will probably noway get the occasion to produce a block. Least proof of stake addresses this by allowing small balance holders to stake a node. The node gains access to all the funds staked to it for the purposes of determining its odds of forging a block. But control of the funds remains entirely in the hands of the staking individual, that individual then takes a proportionate share of the fees generated if their least knot forge is a block. Delegated proof of stake works else. In this case, the number of currency tokens you own represent the number of votes you have to nominate a witness, who among other witnesses is trusted to reuse and validate transactions in quantities relative to the number of votes they have. However, they can snappily be suggested out and replaced by other witnesses, If a substantiation turns out to act fraudulently. The top substantiations get paid the most so there's competition to be a good honest witness. The delegated proof of stake model also has a group called the delegates, who are trusted parties that manage the operation of a network but do not take part in transaction validation and block production. This one is much like proof of stake in that those with a greater share of currency have a greater probability to forge blocks. Still, some further variables are thrown in the blend, which give each node a concerted score and that score is used to determine their share of forging probability. The variables used could be anything judged to be healthy for the network.

A. Properties of Consensus Mechanisms

Distributed Consensus Algorithms have the properties shown in Fig. 4, to make the system work appropriately and prevent any kind of failure or glitch in the system.

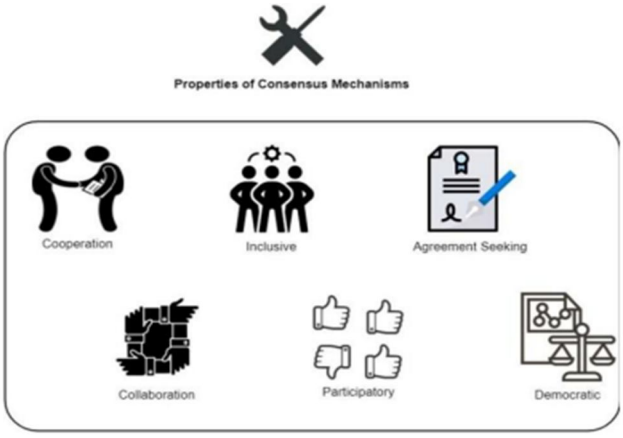


Fig.5 Properties of Consensus Model

1) *Collaboration* – All the nodes in the system should work together with the interest of the whole group as the objective .
2) *Cooperation* – System entities should work as a group rather than an individual with personal interests .
3) *Inclusive* – Make sure there is a maximum number of participation from the group .
4) *Participatory* – Active participation by the group is required for being successful .
5) *Agreement Seeking* – Bring as much as agreement from the individual nodes participating in the system .
6) *Democratic* – Each and every vote casted by the individuals should have an equal weightage.

B. When to use a blockchain

1) The first question to ask about your project is, do you need a database?

However, you do not need a blockchain, If you do not need a database at all. BitTorrent, for illustration, is a peer-to- peer file sharing system that does not have a database, so it wouldn't need a blockchain.

2) Next ask, do you bear shared right access?

The function of blockchain is to spread the authority to write amongst a group without any one group controlling access. However, you do not need a blockchain, If you do not need to partake this access with multiple people or groups or organisation or entity. For illustration, if your organization wants to collect traffic information and sell it, you do not have to have multiple groups that write to the database, so you do not need a blockchain.

VII. USES CASES

A. Self-Sovereign Identity and Reputation

We call it autonomous identity and we suppose it'll help unleash Web3.0. Identity is about communicating who you are, proving your personal information is critically important and nearly every in traction we've with companies, with governments, with service providers, with social groups and further. Sounds simple and it may have been when people only distribute with others they knew face-to-face, but in a global and digital world this model grounded on personal trust does not scale, and is in need of a complete overhaul. That overhaul is putting you the user in control of your own particular data. There are three major classes of identity systems, each of which have failings that we'll learn from. First, national identity systems were erected to help nation states organize its services and people. So they're rigid and hierarchical. Likewise1.1 billion people are still barred from these introductory forms of identity, limiting their capability to share in ultramodern societies. Second, usernames or watchwords are extremely inefficient and insecure with extra and siloed data scattered on the web, and huge burdens on both people and companies to keep track of unsecured passwords. finally, single sign-on systems and affiliated identity provided by large pervasive tech companies add some convenience but lead to massive value attention in the hands of a few important chains, growing privacy enterprises and security pitfalls.

B. Supply Chain and Asset Tracking

A block chain based platform for modelling business processes, tracking assets and constructing the supply chains of the future. Supply chains have been converted beyond recognition over the last time. Vaticinations from eMarketer suggest that global ecommerce sales will increase to 16 of all deals in 2020. This is an increase of 19, driven by the rapid-fire shift in buyer geste due to social distancing and lockdowns. This is creating demand for smart asset tracking, enabled by the Internet of Things (IoT) and GPS (Global Positioning System) results, to help reduce the loss of goods through loss and theft and to identify where in the chain damage occurs. The demand for asset shadowing results in force chain management is quickly increasing due to the extreme significance of supply chain transparency and enhanced track & trace openings. The New York Times has conducted a study revealing a tremendous number of packages that do n't reach their final destination in the United States. According to the rearmost World Bank Logistics Performance Index (LPI), which measures all major countries 'logistics capabilities, track and trace is one of the six strength pointers that make countries seductive and practical to source goods from. New digital advances like the confluence of the Internet of Effects with artificial intelligence (AI) and blockchain mean you can now communicate multiple characteristics of an asset. These include the position, status and quantifiable data like temperature, speed and provenance.

A global epidemic with multiple lockdowns and strict rules of social distancing has entirely changed the way buyers bear, generating a dramatic increase in online deals. Thus, force chains came subject to complete metamorphosis, making online purchases with volley in stores, direct delivery from the manufacturer, curb side volley, and delivery via smart lockers a usual thing for consumers.

Likewise, the adaptation of force chains also caused their inflexibility that allows meeting consumers' demands. For illustration, thanks to the development of advanced cold chain results, products that spoil snappily and goods with short shelf life can now be fleetly delivered to the client.

Four factors of an asset tracking system

The four central rudiments of an asset tracking system are

1) *Tracker*: The detector itself is fixed to the asset to enable it to be covered and tracked. The shamus sends the asset's position data to a central operation center.
2) *Platform*: The central operation center will generally be equipped with a platform that the company can use for device operation.
3) *ERP*: Asset tracking should integrate with your enterprise resource planning (ERP) and/ or storehouse/ inventory management system. It helps you manage conservation, form and operations (MRO) more effectively.
4) *Connectivity*: The right connectivity is crucial to effective asset tracking. LoRaWAN connectivity is a logical choice for asset shadowing as devices generally have veritably long battery life, making them ideal for multiple long journeys like the weeks or months in global shipping. According to ABI Research, 82 of original outfit manufacturers (OEMs) in the asset tracking space have now made cellular LPWAN their connectivity of choice.

C. Royalties in the Music Industry

Still, you know artists generally get the worse end of the deal, If you know anything about the relationship between record markers and artists. Mega-stars are rare, and so record markers hold on to as important of their earnings as possible to finance all the swings they take and miss. (Also, to maximize their gains.) Before the time 2000 or so, markers had all the influence them. They controlled the product and distribution of records and CDs; they had the plutocrat and connections demanded for creation. Sometimes. an indispensable artist would strike out on their own and start an independent marker. But for the utmost part, the major record markers controlled the assiduity.

Also came the internet. At first, it sounded that train-sharing services like Napster might kill off the major record markers altogether. But the markers were saved by the rise of streaming services like Spotify which helped them make their being back registers more profitable than ever ahead. That was great news for the record markers, but the abecedarian pressures with artists remained. Before Justin Blau set out to upend the record assiduity, he learned how to navigate it as an artist. Recording and producing electronic cotillion music under the name 3LAU-pronounced **blau,** like his surname-he produced original tracks and remixes for artists including Rihanna, Katy Perry, and Ariana Grande, among others.

Before this time. Blau put it into practice. In February, he vended colorful NFTs of his reader Ultraviolet in an transaction. To nearly everyone's surprise, the transaction generated$11.7 million in deals. This offered an early hint of how the blockchain could uniquely change the music assiduity by barring the record markers and dealing power of his music directly to suckers, Blau generated far further than. any record marker would have paid him.

1) WHAT'S AN NFT?

NFTS allow you to buy and vend power of unique digital particulars and keep track of who owns them using the blockchain. NFT stands for "non-fungible commemorative and it can technically contain anything digital, including delineations, amped GIFs, songs, or particulars in videotape games. An NFT can either be one-of-a-kind, like a real-life oil, or one dupe of numerous, like trading cards, but the blockchain keeps track of who has power of the train.

2) The Future Of Music

Royal is so beforehand in its life-the core product is still in private beta-that it's principally insolvable to guess at its chances. It is not alone in its space either challengers with a analogous take include Royalty Exchange and SongVest Artists enjoy their own businesses on the internet. Perhaps the most egregious recrimination. and on one position, not all that new. (Numerous artists formerly produce businesses of colorful feathers to publish compendiums, organize tenures, and so on) What's new is that the record marker doesn't inescapably need to be a part of it at all. This is important for a lot of reasons, but maybe the most important bone is that You incentivize the creation of different kinds of music Stories pullulate of record markers not feting the genius of their gift. (I Am Trying to Break Your Heart, one of my favourite music pictures, chronicles the rejection of Wilco's masterpiece Yankee Hotel Foxtrot and the band's struggles to release it anyway.) So do stories about the connection of the terrestrial radio assiduity dramatically limiting the music that gets airplay .

D. Decentralised Distributed Blockchain Ledger for Financial Backup data

Blockchain networks keeps evolving since different surroundings require structural changes. Also secure transaction among two or further peer would be accompanied by laid down policies regarding the access control types and warrants. identified blockchain technologies including the Bitcoin and the affiliated blockchain technology, features of blockchain, the pros and cons and the state of the art operations in the field of drug and healthcare. Hash- chain timestamping and proof- of- work algorithm are some of the factors of bitcoin blockchain bandied with illustration of what valid and invalid transactions are. The also illustrated three types of blockchain network, videlicet, the centralized, decentralized and the blockchain In a case study approach of Sacred Capital Pvt Ltd(a registered investment advisory authorized under the Securities Exchange Board of India) was used. The authors highlighted the outgrowth of blockchain perpetration using ledgers with Sacred Capital Pvt Ltd, The blockchain perpetration was geared towards the transformation of Sacred Capital into a distributed independent association, in order to give a blockchain backend support for fiscal activities of customer as well as data analytics and secretary. The outgrowth includes Distribution and Robustness The system had a distributed database with backend developed to run blockchain n a server which ensures robust and immutable ledger.

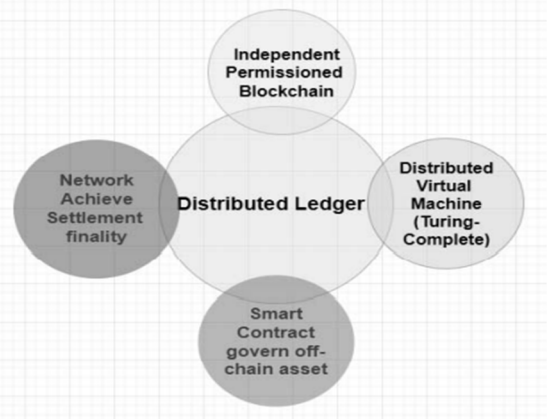


Fig.6 Component of Distributed Ledger

1) *Anonymity*: The cryptographic computations does not show the details of clients.
2) *Computation*: The system has the capability to compute the currency determination without engaging a separate node for the currency determination. After computation of the values, they are added to the blockchain.
3) *Client-Server Model*: The currency determination remains intact while running the blockchain service integrated client server model. However, the front end is responsible for handling client queries and thereafter added to the chain.
4) *Three Layer Architecture*: The availability of the Front End, Middleware, and Backend ensures anonymity while fulfilling necessary requirements.

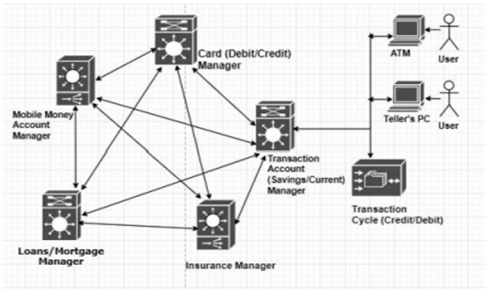


Fig.**7** Proposed Decentralized Blockchain Network for Financial Transaction Backup

Distributed Ledger: By means of a decentralized network, a distributed ledger which correspond of transactions or contracts generally linked together in a form of chain can only be penetrated through a cryptographic keys and digital autographs used to secure the records. Each transaction recordings is made available to sharing nodes. Blockchain was firstly design to serve as a crypto currency, nevertheless it's serves the purpose of a distributed database tally Considering 8 different platforms, the constituent of a distributed ledger has been outlined by Robert Sams, cofounder of Clearmatics, and and reinforced by Waldman's offer as plant in figure.

The eight projects considered in the report(4). What these eight design share in common with four core rudiments as follows

- The use of independent Blockchain(Permissioned not Permissionless)
- Existence of essential or companion distributed Virtual Machine(Turing-complete)
- Smart contracts govern off- chain assets iv. Network achieves settlement finality

E. Decentralized Data Storehouse.

By applying the decentralized blockchain technology which provides clones of the fiscal transactions concurrently to each node. In accessing the block of transactions, the data integrity, verification and confirmation of each sharing node and operation is accomplished through a consensus. The structure of the proposed system enables provides a steady result to maintaining the integrity of fiscal transaction information since all sharing node contribute to the chains of block formation. This also ensures that data can not be destroyed or manipulated by any bank official or any attacker. the consensus procedure guarantees the verification and synchronization of financial data. As found in availableness of multiple data clones in this type of Blockchain proposed in our architecture would efficiently help a failure in single point from affecting the whole system.

VIII. CONCLUSION

To close, Blockchain is the development backbone of Bitcoin. The passed on record value joined with security of Blockchain, makes it to a great degree fascinating advancement to understand the current Financial and further more non-cash affiliated business issues. To the degree the advancement cares, the computerised money based substantially technical academy is either within the slippy inclination of vainglorious desires or in trough of disappointment. The sweats laid on making blockchain indeed more advanced has allowed us to use it for trades. Properties that shields its security, assurance, traceability, trademark knowledge birthplace and time stamping has seen its engagement past its introductory application zones. The Blockchain itself and its varieties square measure by and by habit to grapple any reasonably trades, paying veritably little relation to whether or not or not it's human-to-human correspondences or machine- to- machine. Its gathering emits an effect of being secure particularly with the general ascent of the Internet- of- Things. The Blockchain has been particularly appeared to be correct in creating nations wherever making certain trust is of a vital concern. It shows that the most common subject area is Computer Science, followed by Engineering, Telecommunications, and Business and Economics. In the exploration of Business and Economics, several key nodes are identified in the litera ture, similar as the top- cited papers, utmost productive countries, and most common keywords. After a cluster analysis of the keywords, we linked the five most popular exploration themes " economic benefit, " " blockchain technology, " " initial coin offerings, " " fintech revolution, " and " participating frugality. "

Businesses can profit vastly from blockchain technology. Thus, we suggest that the operation of blockchain be taken into consideration when businesses have the following requirements counting agreement and crowdfunding, data storehouse and sharing, force chain operation, and smart trading.

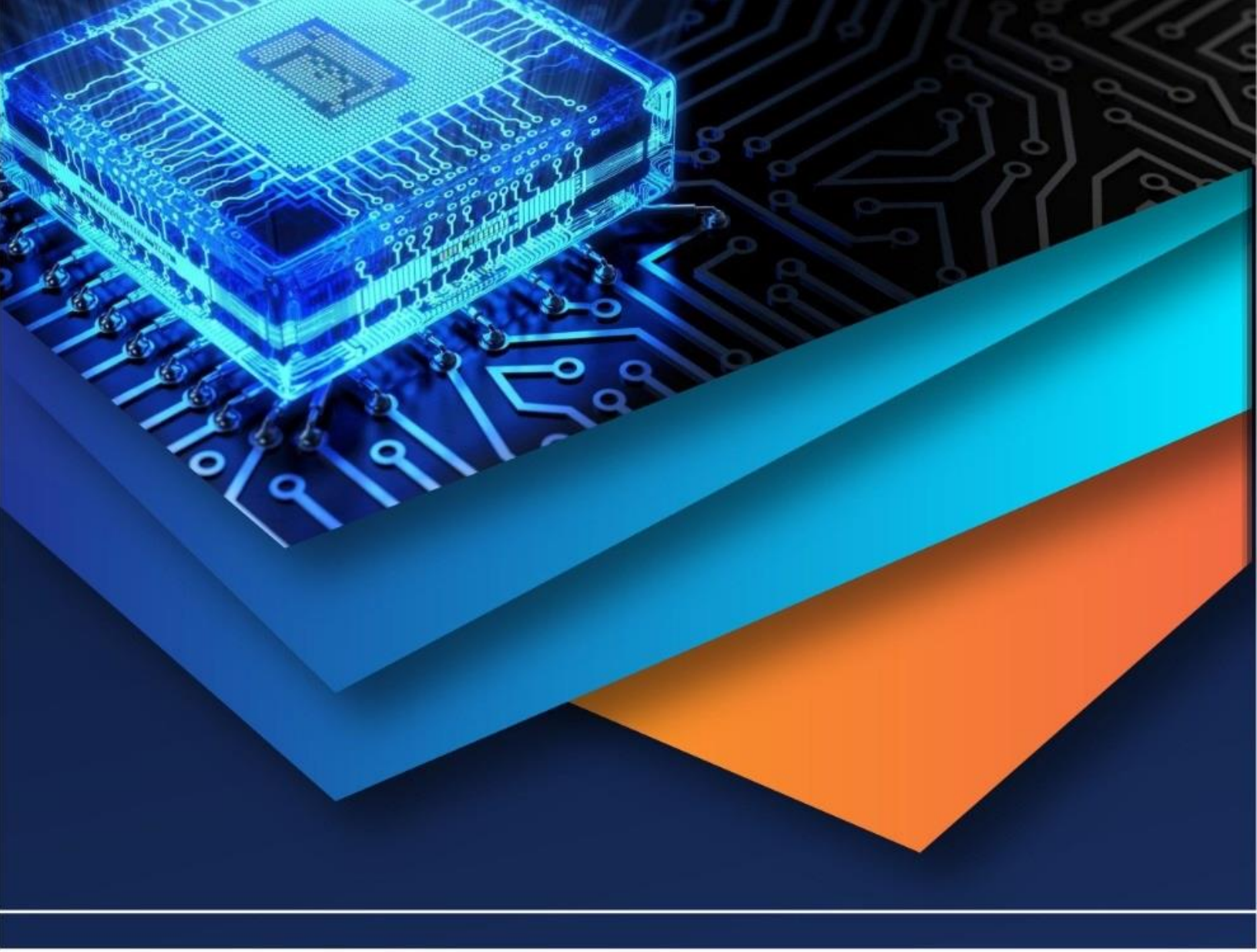
IX. ACKNOWLEDGEMENT

It is a matter of great pleasure and privilege to have this project report entitled: "Blockchain Technology & its Use Cases" with a deep sense of gratitude. We wish to express sincere thanks to our honourable mentor Ms. Seema Devi (Assistant professor, ECE department, HMRITM) who has the attitude and substance of a genius and has been a great source of inspiration throughout the project. I am fortunate to be given the opportunity of working under her. She not only provided the necessary guidance and support, but also continuously motivated us to give our best in the project. It would be our proud privilege to tender the lexes of appreciation in respect Head of department, ECE Engineering for encouragement, guidance, and kind support we would be grateful in thanking department of ECE Engineering, HMRITM for providing us all the mandatory requirements as and when we needed to make the project.

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