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Block Chain Technology

Introduction -

A Block chain is a digital record of transactions. The name comes from its structure, in which individual records, called blocks, are linked together in a single list, called a sequence. They are used for maintaining the record of transactions made with crypto currencies, like Bitcoin, and have many other applications. It is essentially a ledger that is in a digital form which is distributed and duplicated across whole of the network of the computer systems. This is necessarily understood as Distributed Ledger Technology.

In such a model that is distributed, storage and computation are shared between member users, or nodes, connected to a peer-to-peer network. It's been proposed that distributed models, support block chain-based ledgers, also called distributed ledger technology (DLT) or system (DLS), could offer higher service availability at much lower costs for a few sorts of business and enterprise applications.

For example, the property transfers ownership ledgers, trading ledgers, ledger of digital currency and among others. DLT, within suitable conditions provide increased availability of services and resilience for various digital services. This nature that is distributed offers some advantages and creates many opportunities. However, this very distributed nature also creates major challenges and major research questions. It's important to carefully investigate the benefits, disadvantages and risks of a DLS, which the system is implemented correctly before it's employed by the general public, commerce, and industry. It's also important that DLS designers, implementers, and users understand the benefits and limitations of the technology behind these systems.

Chapter-1
Characteristics and Principle: Distributed Ledger Technology.

In a Digital Ledger to feature a transaction every node must check its validity. If the bulk thinks it's valid, then it's added to the ledger. This promotes transparency and makes it corruption-proof. Hence without the consent Block chain is a DLT during which transactions are recorded with an immutable cryptographic signature called a hash. Multiple computers validate each transaction that is added to the Block chain. All of them work together to make sure each transaction is valid before it's added to the block chain.

This network of computers that is decentralized makes sure one system cannot add invalid blocks to the chain. When a replacement block is added to a block chain, it's linked to the previous block employing a cryptographic hash generated from the contents of the previous block. This ensures the chain isn't broken which each block is permanently recorded. It is also intentionally difficult to change past transactions in block chain since all the next blocks must be altered first. This paper aims to trace the concepts of Distributed Ledger Technology and Block chain.

It further goes on to discuss the characteristics and features of this encrypted system, its application in the real world of trade and commerce and how block chain will revolutionize the global market. With the increased and user-friendly application of Block chain, we can hope to eradicate corruption and build a sort of transparency within the system and its coherent active users.

The Distributed Ledger Technology is one of the most secure ways to make transactions across the world, in a very safe and protected manner. Features such as Decentralization and immutability make the system more transparent and increasingly trustworthy. When used in a proper and efficient manner, it is one of the greatest assets of the current times. Some of its important characteristics include-

Decentralized

When a network is decentralized, it means that it doesn't have any governing authority or one person taking care of the framework. Rather a herd of nodes maintains the network making it decentralized in nature.

This is one among the key features of block chain technology that works perfectly. Block chain puts the users during a straightforward position, because the system doesn't require any governing authority, the users will directly access it from online and store their assets there. A user can store anything ranging from crypto currencies, important documents, contracts or other valuable digital assets. And with the assistance of block chain, the user will have direct control over them using their private key. So, we see that the decentralized structure is giving the folks their power and rights back on their assets.

Immutability

There are many important features in block chains, among which “Immutability” is undoubtedly a key features of block chain technology. It makes the system uncorrupted. Immutability essentially means something that can't be changed or altered. This is often one among the highest and important block chain features that help to make sure that the technology will remain uncorrupted, because it is – a permanent, unalterable network.

Block chain technology works slightly different than the standard banking industry. Rather than counting on centralized authorities, it ensures the block chain features through a set of nodes. Every node on the system features a copy of the previous from the bulk of nodes, nobody can add any transaction blocks to the ledger. Another fact, which backs up the list of key block chain features, is that, once the transaction blocks get added on the ledger, nobody can just return and alter it. Thus, any user on the network won't be ready to edit, delete or update it.

Enhanced Security

As it gets obviate the necessity for a central authority, nobody can just simply change any characteristics of the network for his or her benefit. Using such encryptions ensure another layer of security for the system. It is very secure because it offers some sort of a special disguise – Cryptography. Additionally with decentralization, cryptography lays another layer of protection for users. Cryptography may be a rather complex mathematical algorithm that acts as a firewall for attacks. The information on the block chain is hashed cryptographically. In layman terms, the knowledge on the network disguises and hides the true nature of the information. For this process, any input file gets through a mathematical algorithm that produces a special quite value, but the length is usually fixed. You could consider it as a singular identification for each data. All the blocks within the ledger accompany a singular hash of its own and contain the hash of the previous block. So, changing or trying to tamper with the information will mean changing all the hash IDs. And that's quite impossible. Users will have a personal key to access the info but will have a public key to form transactions.

Consensus

Every block chain thrives due to the consensus algorithms. Such an infrastructure is cleverly designed, and consensus algorithms are at the core of this architecture. Every block chain features a consensus to assist the network make decisions. In layman terms, the consensus is a decision-making process for the group of nodes active on the network. Here, the nodes can come to an agreement quickly and comparatively faster. When many nodes are validating a transaction, a consensus is completely necessary for a system to run smoothly. User may consider it as quite a electoral system , where the bulk wins, and therefore the minority has got to support it.

The consensus is liable for the network being trustless. Nodes won't trust one another, but they will trust the algorithms that run at the core of it. That's why every decision on the network may be a winning scenario for the block chain. It's one among the advantages of block chain features. There are many different consensus algorithms for block chains over the world. Each of it has its own different and unique way to make decisions and perfecting previously itroduced mistakes. This architecture

forms a realm of fairness on the online platforms. However, to make the decentralization going every block chain must have a consensus algorithm, alternatively the core value of its lost.

Faster Settlement

Traditional banking systems are quite slow. Often times it can take days to process a transaction after finalizing all settlements. It can also be corrupted quite easily. Block chain provides a faster settlement compared to traditional banking systems. In this manner a user can transfer money relatively faster, which saves tons of one's time.

These block chain features make life easier for foreign workers and help to know why Block chain is vital. Many of us visit another country in search of a far better life and job, however, sending money to families overseas takes a lot of time and can become tedious. Block chains are way too fast, and can be easily and effectively used to send money to anyone across the globe. Another important fact is that of the smart contract system. That will allow making faster settlements for any quite contract. This is often one among the simplest benefits of block chain features to the present day. And as the third party out of the way, people can send money with a minimal fee. This way block chain will impact the international trades as well.

Chapter-2
Real life Applications: Block chain technology.

Block chain technology can be employed in a number of industries including Financial Services, Healthcare, Government, Travel and Hospitality, Retail and CPG. The use of Block chain will make life increasingly easy and trade more efficient. Block chain will revolutionize a wide variety of fields and will make navigation easy in this digitalized world. As this is a highly secure system and is not liable to corruption, this technology will prove to be highly important in the coming times. Some of its real life practical applications are discussed in the following-

Financial Services

In the financial services sector, this technology has already been acted upon in many different and innovative ways. Block chain technology clarifies the entire process associated with asset management and payments by providing an automated trade lifecycle where each participant will have access to the exact same data about a transaction. This removes the necessity for brokers or intermediaries and ensures transparency and effective management of transactional data.

Payment processing and money transfers

Arguably the foremost logical use for block chain is as a way to expedite the transfer of funds from one party to a different. As noted, with banks far away from the equation, and validation of transactions ongoing 24 hours each day , seven days every week , most transactions processed over a block chain are often settled within a matter of seconds.

Healthcare

Block chain can play a key role within the healthcare sector by increasing the privacy, security and interoperability of the healthcare data. It holds the potential to deal with many such challenges within the sector and enable secure sharing of healthcare data among the varied entities and other people involved within the process. It removes the interference of a third-party and also avoids the overhead costs. With Block chains, the healthcare records are often stored in distributed data bases by encrypting it and implementing digital signatures to make sure privacy and authenticity.

Government

Block chain technology holds the facility to rework Government's operations and services. It can play a key role in improving the information transactional challenges within the Government sector, which works in silos currently. The proper linking and sharing of knowledge with Block chain enable better management of knowledge between multiple departments. It improves the transparency and provides a far better way to monitor and audit the transactions.

CPG and Retail

There's an enormous opportunity for Block chain technology to be applied within the retail sector. This includes a number of things from ensuring the authenticity of high value goods, preventing, fraudulent transactions, locating stolen items, enabling virtual warranties, managing loyalty points and streamlining supply chain operations.

Travel and Hospitality

The appliance of Block chain can transform the travel and hospitality industry . It is often applied in money transactions, storing important documents like passports, voter ids and other identification cards, reservations and managing travel insurance, loyalty and rewards.

Monitor supply chains

Block chain also comes in particularly handy when it involves monitoring supply chains. By removing paper-based trails, businesses should be ready to pinpoint inefficiencies within their supply chains quickly, also as locate items in real time. Further, block chain would allow businesses, and possibly even consumers, to look at how products performed from a quality-control perspective as they traveled from their place of origin to the retailer.

Retail loyalty rewards programs

Block chain will go on to transform the retail experience by becoming the go-to for loyalty rewards. By creating a token-based system that rewards consumers, and storing these tokens within a block chain, it might incentivize consumers to return to a particular store or chain to try to to their shopping. It might also eliminate the deceit and waste commonly related to paper- and card-based loyalty rewards programs.

Digital IDs

A little over 1 billion individuals worldwide face identity challenges. Microsoft (NASDAQ:MSFT) is looking to vary that. It's creating digital IDs within its Authenticator app -- currently employed by many people -- which might give users how to regulate their digital identities. This will allow folks in impoverished regions to urge access to financial services, or start their own business, as an example. As of now Microsoft's attempts to make a decentralized digital ID are still within the early stages.

Data sharing

Cryptocurrency IOTA launched a beta version of its Data Marketplace, demonstrating that block chain might be used in a marketplace to share or sell unused data. Since most enterprise data goes unused, block chain could act as an intermediary to store and move this data to enhance a number of industries. While still in its early stages, IOTA has quite 35 brand-name participants offering it feedback.

Copyright and royalty protection

In a world with increasingly widespread internet access, copyright and ownership laws on music and other content has grown hazy. With block chain, those copyright laws would be beefed up considerably for digital content downloads; ensuring the artist or creator of the content being purchased gets their justifiable share. Block chain technology will also provide also real-time and transparent royalty distribution data to musicians and content creators.

Digital voting

Voter fraud can be clarified via block chain technology. Block chain offers the power to vote digitally, but it's transparent enough that any regulators would be ready to see if something were changed on the network. It combines the convenience of digital voting with the immutability (i.e., unchanging nature) of block chain to form your vote truly count.

Land and auto title transfers

One of the first goals of block chain is to require paper out of the equation, since paper trails are often a source of confusion. If one is buying or selling land, a house, or a car, you will need to transfer or receive a title. Rather than handling this on paper, block chain can store titles on its network, allowing a transparent view of this transfer, also as presenting a crystal-clear picture of legal ownership

Immutable data backup

Block chain may additionally be the right way to copy data. Albeit cloud storage systems are designed to be a go-to source for data safekeeping, they are not resistant to hackers, or maybe infrastructure problems. Using this as a secure backup source for cloud data centers -- or for any data, as Boeing is considering with GPS receivers on its planes -- could resolve this concern.

Medical recordkeeping

The good news is that the medical sector has already been moving faraway from paper for recordkeeping purposes for years. However, block chain offers even more safety and convenience. Additionally to storing patient records, the patient, who possesses the key to access these digital records, would be on top of things of who gains access thereto data. It might be a way of strengthening the laws that are designed to guard patient privacy.

Equity trading

At some point, block chain could rival or replace current equity trading platforms to shop for or sell stocks. As its networks validate and settle transactions so quickly, it could eliminate the multiday wait time investors encounter when selling stock(s) and seeking access to their funds for the aim of reinvestment or withdrawal.

Managing Internet of Things networks

Networking giant Cisco Systems could also be behind a block chain-based application that might monitor Internet of Things (IoT) networks. The IoT describes wirelessly connected devices which will send and receive data. Such an application could determine the trustworthiness of devices on a network -- and continuously do so for devices entering and leaving the network, like smart cars or smart phones.

Expediting energy futures trading and compliance

Even the energy industry is getting into on the act. Almost the advantages it could bring back equity traders above, block chain offers the power to assist energy companies settle futures trading considerably faster than they currently do. It is also worth mentioning that this could help energy companies with reference to logging their resources and maintaining regulatory compliance.

Securing access to belongings

Smart contracts within block chain networks even have the power to be customized to businesses or consumers' needs. As a consumer, you'll use block chain as a way to grant access to your house for service technicians, or allow your mechanic access to your car to perform repairs. But without this digital key, that only you possess, these service technicians wouldn't be ready to gain access to your belongings.

As mentioned the active use of Block chain has multiple uses in the current world. Block chain ensures security and protection of the consumers and their related data or files. Assisting a great deal of fields from government sector to healthcare to finance, Block chain is all set to become the next big thing in the coming decades.

Chapter-3
Block chain and its Revolution in Market and Finance

Invented almost a decade ago in 2008, the block chain technology has depicted the change that it can usher in different business areas. The technology, even in its early days, has disrupted different industries and sectors. Different characteristics of Block chain like decentralization, immutability, and transparency make it appealing for business sectors and domains all across the planet. One such industry that's leading the way in exploring the potential of block chain is that of the banking and finance industry.

Though there are several roadblocks within the way currently, it is often surely said that Block chain holds the potential to rework the finance and banking sectors by reducing potential costs and labor savings. Consistent with a PwC report, 24% of monetary executives from all round the world are very conversant in block chain technology, with Americans significantly more familiar than those from other regions. Observing the wide-reaching implications of the technology, companies are constantly researching to seek out out the ways of applying block chain in multiple sectors.

Talking specifically about the banking and finance sector, hundreds and thousands of funds are being regularly transferred from one region of the planet to a different every day. This makes the worldwide economic system one among the foremost popular sectors that would be benefited through the application of Block chain. Operating on the idea of highly dependent manual networks, the banking and finance sector is susceptible to errors and frauds that would cause a crippled money-management system. Consistent with Global Fintech Report 2017, 77% of Fintech institutes expect to adopt block chain as a part within the production system or process by 2020.

Finance

Block chain clearly will have significant impacts on the finance function, and most organizations will gradually adopt the technology as they envision a replacement operating model for finance. It followed a number of trends in its application. Block chains will hook up with existing financial systems. Despite the advantages of block chain, it'll not replace traditional ERP systems overnight. Instead, distributed ledgers firstly will supplement the systems of record, specifically in cases where balances are frequently recalculated as transactions occur. And while block chain enables a real-time view of knowledge, the mixing with legacy systems may cause a delay in harnessing the last word value of the distributed ledgers. The regulatory environment will remain in flux. As block chain decentralizes financial activities, governments will continue striving to know and regulate the technology. And people that do so effectively will have a chance to draw in global investment and become frontrunners during a block chain economy

Block chains are going to be a hybrid of personal and public ledgers. As block chain technology grows and evolves, we expect finance organizations to start out with private block chains— like a ledger shared within a corporation or shared by a corporation and a vendor—which will make it possible for them to retain sensitive data while gradually embracing more public ledgers. These could include permission block chains for industry consortia and other entities, also as truly public block chains that operate in an open marketplace.

Various Implications of Block chain

It leads to increased efficiency from transparent records and one source of truth. By creating one version of a ledger that's synchronized across computers, block chain can help eliminate out-of-sync ledgers and, therefore, the necessity for reconciliations. Transparency can also cause other benefits. In trade finance, for instance , all parties are going to be ready to see when goods have shipped and review all steps of the transaction, which can significantly reduce the settlement time.

It Enhanced data integrity to scale back loss. With such records that cannot be changed, that are visible to everyone involved, block chain may improve data accuracy and security, help reduce the danger of fraud, and show compliance through an audit trail. for instance , when supply chain information is placed on a block chain, companies can potentially reduce fraud and errors, improve inventory management, identify issues more quickly, reduce delays from paperwork, and increase trust among all parties. Block chain also offers the potential to make one source of data around customer identity, reducing costs and risk associated with Know-Your Customer regulations.

There has been improved customer experience through faster processing. By using block chain to share information with clients and vendors, companies could also be ready to tap sales opportunities and serve customers much more quickly than with traditional systems for fixing new relationships. Block chain also can enable consolidated, accurate repositories of customer information which will be accessed by all parties within the network. Because of consensus mechanisms and smart contracts, block chain can minimize the time that capital is engaged for a transaction, instead triggering an automatic transfer of funds upon an agreed set of conditions. Block chain also will eliminate some transaction fees by reducing reliance on third parties, and it'll likely release capital flows because the purchase of managed funds moves to real time.

The Effect on Network

China's advancement in block chain technology triggered the network effect where it'll be utilized in many case studies. Today, internet of the public is widely opened, and unfortunately, it cannot protect everyone's privacy concerns and data .Besides, middle platforms or sharing-economy businesses like Spotify or Facebook are taking advantage of people's creative contents. However, block chain features a peer-to-peer decentralized commerce nature, and this “modern internet” is giving a replacement definition to the web. The use of the new digital currency in China is simply the start of the block chain. Another example of the network effect is that the block chain-backing tokenization of virtual goods in gaming. Here, the sport providers offer to their players the prospect to interact closer than ever. For instance, some casino gaming operators offers unique digital accessories on block chain for players. There's a “smart contract” facilities that are provided by some block chain networks, like Ethereal which allows for a few agreement creation which can be executed when certain conditions are met.

Economists perceive the adoption of technology along the lens of reducing or eliminating inefficiencies, improving outcomes at the base and aggregate levels. One of the much inefficiency that block chain will help eliminate is what Catalini and Gans call 'the cost of networking': inefficiencies that arise because of the market power of internet giants like Google, Amazon, and Facebook etc. Reducing the value of networking is going to be a game changer for the economy, because it'll disentangle the advantages from network effects from the detrimental impact of market power.

Network effects are a circumstances whereby the worth to the user or consumer of a product or service increases as its user base grows. Facebook, for instance , is more compelling to potential users today than it had been when it had been limited to only Harvard undergraduates; there are more people to attach to, making it a more useful product. The effects of network can only be leveraged if users are ready to interact on an equivalent network. So albeit the general marketplace for a networked product is extremely large, it'll have less value if that market is segmented.

Economists have long argued that network effects cause natural monopolies for exactly this reason of fragmentation; the general value delivered to users will exponentially grow if rather than having competing networks, everyone uses an equivalent one. While it's become apparent that digital platforms like Facebook and Uber aren't necessarily monopolies, there's little question that increasing returns to scale give these platforms with tremendous market power.

Market power arises when users or customers have few comparable alternative options for sources of the great or service being provided. This provides the vendor the power to boost prices, or in the case of some internet giants to charge transaction fees, compile and sell user data, all as a condition for giving users access to the platform.

Each of the above mentioned strategies of monetization, using market power as a tool, creates inefficiencies. These inefficiencies emerge within the sort of users opting out of a platform that might deliver them value above the incremental cost incurred by the supplier. They also come at the value of some transactions that might otherwise end in gains from trade not occurring because fees outweigh the benefit.

The value of block chain results from its potential to be used as a mechanism of passing on assets, which makes it a dead-ringer for the industry associated to finance where most efforts so far are focused, but at a fundamental level, those assets are just series of ones and zeroes. Whether the data is cryptocurrency or a UDP stream, anywhere a centralized data link between two nodes is required could likely be affected from block chain. As cloud-based architectures become standard for business applications, the normal data center might not be the perfect facility to accommodate the expedient access of real-time data. With edge devices playing a greater role in networking and bandwidth speeds increasing to the double digits and beyond, data center infrastructure must adapt to the approaching landscape to ensure the rapid and seamless transfer of knowledge.

Block chain technology makes a distributed and cooperative cloud storage environment over a peer-to-peer network possible which might offer more resiliency and higher-speeds at a lower cost. Storage vendors that hire out their available space would offer the backbone for a storage-based block chain. At a lower level, anyone with an online connection and additional space on their disk drive can participate. Security isn't a problem thanks to innate cryptographic functions and distribution addresses latency issues. Best of all, nobody owns or controls your data but you. Seems farfetched, but early adopters like Storj are already offering services during this space.

The technology to realize all of this won't be there yet, but it's definitely learning steam and everyone wants to jump aboard. IBM is presenting its own block chain for financial transactions. The Hyper ledger Project from the Linux Foundation aims to use block chain technology to enterprise applications and even Microsoft's Azure is adopting block chain technology. Regardless of where you or what space you're in, block chain technology is that the way forward for the Internet of Things.

Chapter-4
Future of Block chain in India

Block chain technology remains in its nascent form in India. For tons of industries within the country, it's still an idea that's yet to be understood. As per a report released by Nasscom 2 years ago, titled 'NASSCOM Avasant India Block chain Report 2019', majority of the mid- and large-service providers have but 5 per cent of block chain projects in India, which is low in comparison to their projects in other geographies like North America and Europe. Even among block chain start-ups, while risk capital investments worldwide were as high as $5.6 billion, India was ready to attract only 0.2 per cent of them. Furthermore, India accounted just for about 2 per cent of all the block chain start-ups, globally.

After the ban of old currency notes in 2018 by the Government of India, the Indian financial institution banned the trading of crypto currencies since a string of frauds were reported. But the cryptocurrency exchanges filed a lawsuit within the Supreme Court of India asking to revoke the ban. Finally, subsequently almost two years later, the ban was lifted in March 2020, bringing the trading in cryptocurrency back in India. As per estimates, there are a minimum of 10 exchanges in India as of 2020 that allow investors to trade cryptocurrency. Experts believe that with proper law and more regulations to take care of the autonomy and ensuring the cryptocurrency exchanges follow some basic KYC verifications of the owners, it'll give way for widespread adoption of crypto currencies for a number of applications.

Though crypto currencies, when wont to their full potential, are expected to disrupt many existing financial systems, there are many technological challenges in creating an entire ecosystem that embraces crypto currencies. Financial institutions are taking baby steps in including cryptocurrency in their portfolio of offerings.

Some of nation's bigger firms in technology have also started showing interest in creating a platform to trade cryptocurrencies. As more and more financial institutions show interest in embracing block chain technology and cryptocurrencies, with support from the governments and regulators, cryptocurrencies are only expected to become more important and prominent. As of now, block chain technology and cryptocurrencies are still considered in their nascent form and therefore the technology cost involved in creating and maintaining is extremely high. But as more and more players emerge within the market, newer and cost-effective technologies are expected to emerge, paving the way for widespread adoption of cryptocurrencies.

With the advancements in the field of technology and science, cryptocurrencies are set to form a major part of the economy. With the enormous benefits that it offers like security and protection, and the ability to remain un-corrupted throughout, Block chains and cryptocurrencies are the next big thing. Though India, is relatively new in this race, making it all the more reason for aspirants to educate themselves and form their expertise in this field. As the world economies move towards unification, promising a more trustworthy and transparent system of interchange and transactions, it can be only achieved by the means of Cryptocurriencies. Surely, there are issues regarding rules and laws that might govern this field, but apart from such small limitations Block chain technology is set to boom in the coming times, not only in India but also worldwide. The emergence of such technologies has made the study of Computer Science and Cyber Security an essential pre requisite in the coming times. Individuals who pursue these fields and possess a thorough knowledge of the same will indubitably be in high demand. It will be their understanding of these complex mechanisms that will be an asset. On the other hand, individuals who lack such awareness and knowledge will be left behind in the fast growing world and will prove to be a liability. Students must be effectively encouraged to pursue such promising and fulfilling career options. With a plethora of job opportunities waiting, the fields of Computer Sciences and Cyber Security will promise well paying job opportunities and career security. As the Block chain Technology grows, so does the need of skilful individuals, highly trained and in possession of the knowledge regarding the same. And hence, it can be positively concluded that in the coming decades, Computer Science, Cyber Security and a quality understanding of its real life applications are some promising and fulfilling fields.