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Towards Applicability of Block Chain in Aviation Industry

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Abstract: Aviation sector is an important sector as far as transportation of passengers and cargos is concerned. Security of luggage's, cargos, passengers is utmost important. A blockchain is a digital, private, and open record where bitcoin or other advanced cash transactions are recorded in a very detailed record requirement. This record is called a "blockchain." A block is the "most recent or current" part of a blockchain that tracks transactions that are still going on. Once a block is done, it is permanently stored in the blockchain. A block chain is capable of addressing most of the security issues related to airlines sector. Blockchain along with internet of things and machine learning is capable of converting existing airlines into smart airlines. Blockchain has the potential to provide security and privacy to passenger details, ticketing process, maintenance and repair operations and tracking and monitoring. This article demonstrates that Blockchain may be used in many aviation sectors services and is protected against malicious attacks, providing security and immutability.

Key words: Aviation Industry, Security, Privacy, Blockchain, Distributed Ledger.

1. Introduction

Businesses like travel agency, ground handling services, and other activities are part of the aviation industry and contribute to its growth. Adaptability to technological progress is a key for the exponential development of this industry and towards the improvement of its corporate operations. Blockchain technology, although in its infancy, is regarded as a disruptor and a driver of change for the aviation sector.

According to the relevance of Bitcoins, Blockchain technology [1] moves data nodes and data streams from one informatics centre to another in order to create an information chain reaction network. Interconnected patterns of information are typically used to construct secure transactions in blockchains. This led to a focus on Blockchain technology, which has now become a part of the world of financial and technological interactions.

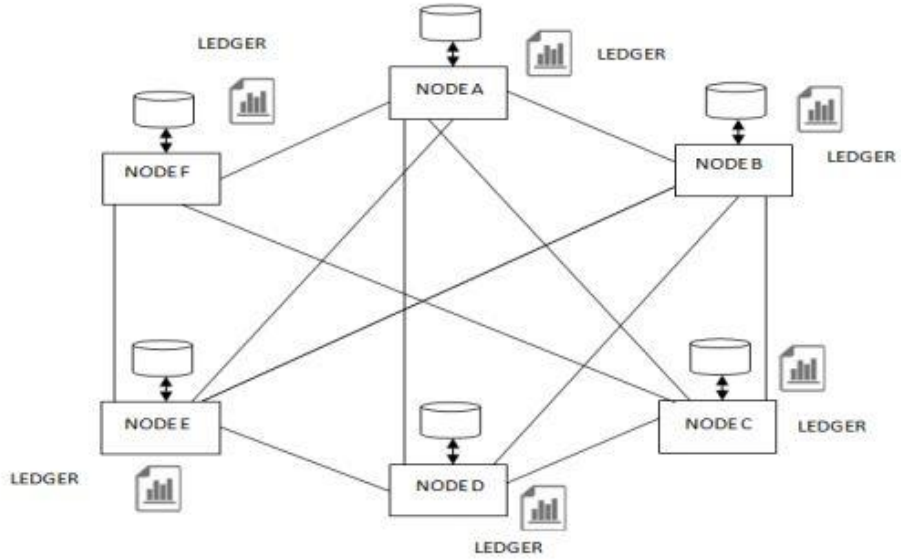

Figure 1: Distributed Ledgers

Every peer in a particular network has access to all of the network's information, which is stored safely on the Blockchain (Figure 1). This information is frequently kept in a "Ledger." Records of system data, node values and configuration files are kept in a ledger. The ledger is tasked with storing the current value of all network information at a specific point in time. It is the total censure factor of the network that is allocated to each node. Rather of being tied to a certain country, the value of each node on a network address is known as a "Bitcoin" (or "digital money") [2].

Blockchain networks may prove to be a more effective tool for altering the air transportation offering and enabling airports to become "smart airports" in the future. This article explains how Blockchain technology may be applied in a variety of aviation sectors while being secure and impervious to hostile attacks, hence offering security and immutability [3].

2. Blockchain Working

Bitcoin or advanced cash transactions are recorded in an incredibly generated record required on a blockchain, which is a digital, restricted, open record of those transactions. In a blockchain, a block is the "most recent or current" part of the system. In the blockchain, once a block has been completed, it is permanently preserved. It's impossible to stop the creation of new blocks once they've been started. When making a direct, built record request on a huge blockchain, many of these blocks are related to each decision you make.

A copy of the data from previous blocks is included in each block's hash. A blockchain makes it incredibly difficult to change data once it has been deposited. Because of this, blockchains are being employed in applications like as money management and real estate. Customers can use Blockchain, a substitute blockchain-based technology, to run their internet apps on their local and basic computers. The blockchain instrument, which does not require a server, can be used to store or administer customer data or apps on their appliances [4].

Peer-to-peer networks are used to distribute and maintain blockchains. Distributed ledgers don't need a central authority or server to control them, and their data quality may be maintained by database replication and computational trust. A form of it is the distributed ledger technology (DLT) popularly referred to as blockchain. Consensus in distributed ledgers can be achieved without a chain of blocks,

however this is not always the case. The Blockchain's design distinguishes it from other distributed ledger technologies. Unauthorized access to data is prevented by using the blockchain to store and encrypt it [5].

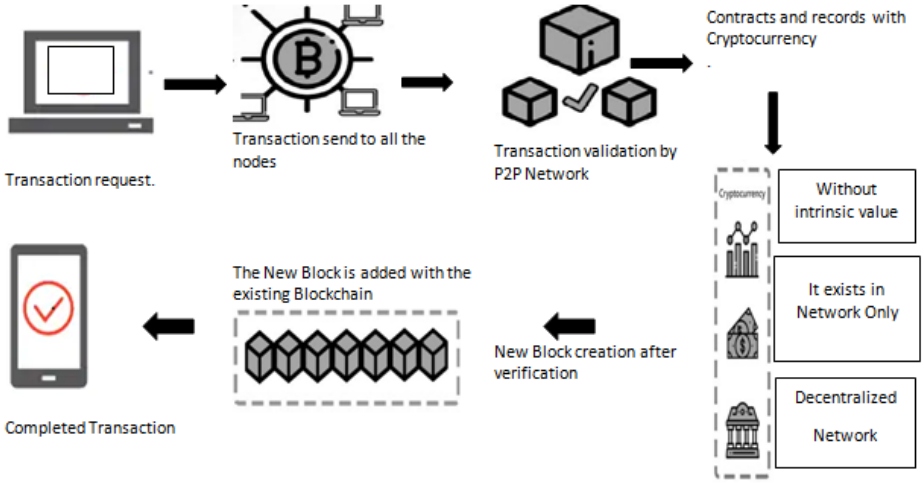

Figure 2: Blockchain Working

With the most recent advancement in Blockchain technology, one of the most significant flaws in present technical systems has been addressed. To process app profiles and schemas, a network or system's connectivity can be improved by including Blockchain. Several scholars have swiftly and extensively analyzed the impact and applications of Blockchain technology [46].

The decentralized nature of Blockchain technology [7] makes it an ideal tool for tracking and reconciling previous transactions in real time. The entire security of the Blockchain system is critical when it comes to networking, Internet of Things (IoT), commercial transactions, and more. Blockchain technology deployment at the physical layer was approached by a small group of academics who attempted to address some of its most challenging and difficult issues.

2.1 Component of Blockchain

The main component of blockchain is a distributed network, shared ledger, and digital transactions. [8]

a) Distributed network - Because it's a peer-to-peer network, all peers can use it and participate. Using the shared ledger lists, each node application's rules may be tracked. Each peer will check and double-check digital transactions before approving them. With a unique cryptographic signature and timestamp, each record is infallible.

b) Shared Ledger - Blockchain security and performance are dependent on the Consensus algorithm, which determines how the blockchain will operate. In a blockchain, each block is linked to those that came before it. To begin, records are added to the transaction pool, and then the miner creates a block and other miners in the network attempt to answer the mathematical problem. The first miner to solve the riddle successfully wins a reward in the crypto currency.

c) Digital Transactions - The block contains digital copies of each record. The blocks have been arranged in reverse chronological order. Every record is encrypted and digitally signed to assure its validity and correctness.. All of the blocks are interconnected, so they can't stand alone.

2.2 Properties of Blockchain

There are several characteristics of blockchain, as stated in table 1. These characteristics are: decentralization; transparency; immutability; autonomy; open source; anonymity; and consensus [9].

Key Elements	Description
Decentralized	The open-source anyone can connect to the network. No central authority.
Transparent	The records stored in the blockchain, which is transparent.
Immutable	Data that exists earlier in a blockchain cannot modify.
Autonomy	It is the independent system, and each node can access, store, update the record safely.
Open-source	It is an open-source anyone can connect to the network.
Anonymity	Each transaction is available in different nodes, and it is unique, and data are anonymized.
Consensus	New transactions added to the blockchain after participant nodes agree that they are valid.
Authentication	Cryptography and digital signatures prove participants' identities.

Table 1: Properties of Blockchain

A block is a record of all the transactions that have occurred in a given time period. The genesis block is the first piece of the puzzle. New blocks are added when the transaction size increases. Connected blocks in the past and present. The block chain provides this data format. Tamper-proof and irreversible blockchains are the norm.

Decentralization is a key feature of the blockchain, which is made possible by the numerous organizations that make up the network. The cryptographic hash value of the medical record. Everyone has access to and can save the asset online without the assistance of a third-party service. You may later access any transaction you've stored, including crypto currency, documents, contracts, and digital assets, using the private key [10].

The entire network must agree and trust a transaction before it can be added to the blockchain. If the agreed-upon rules are not followed, the transaction is ruled invalid. Whether a blockchain is permission or permission less depends on the agreement-based standard it follows. Anyone can try to include transactions and participate in the consensus if there is a public consensus. Before transactions can be added to the chain, nodes participating in permission-based protocols must be permitted and distinguished.

Once a transaction has been recorded in the ledger, it cannot be reversed. To fix a problem, you'll need to use various transactions. After they've been recorded, both transactions should be accessible. All transactions that have been agreed upon by the chain's members are recorded on the blockchain.

The system is safer because every transaction is encrypted. Cryptography is a more complex mathematical strategy when it comes to defending against intrusions. This hashing algorithm, which uses the SHA256 algorithm, generates hash values that are always the same length [11].

Anyone can access the block chain’s digital address, but the names of those who utilize it remain hidden. For the foreseeable future, the blockchain will keep account of every transaction. The transaction's hash value can be viewed by anyone, but the user's identity is protected.

3. Applications of Blockchain in Aviation Industry

Aircraft manufacturers, airports, airlines, aircraft replacement parts makers and ground handlers all play a role in the aviation sector. For its dispersed, decentralized nature, blockchain technology has been much praised. The following is a list of possible uses for blockchain technology in aviation.

- Securing Customer Loyalty Program

- Securing Crew Certification
- Real Time Monitoring and Tracking of Luggage
- Securing Maintenance and Repair Operations
- Securing Air Ticketing Process

Regular flyer miles, often known as customer loyalty programmers, reward frequent flyers for utilizing airline services. Customer loyalty programmers confront a number of issues, including poor award redemption rates, expensive maintenance costs, and dangers to data theft. Loyalty accounts were the target of 11% of data theft incidents in 2017. Aside from this, present systems tend to benefit businesses rather than consumers. It is estimated that 36% of passengers do not redeem the loyalty incentive because of the complicated redemption process [12]. Loyalty program often require passengers to accrue a certain number of points before they may get a prize. There is a lack of openness and accountability in conventional systems when it comes to the generation, redemption, or transfer of loyalty points to customers.

Blockchain technology may be able to tokenize customer incentive points so that they may be used immediately after a sufficient number of tokens have been acquired [13]. Using blockchain, there is no way for an airline, hackers, or even a third party responsible for managing and controlling the loyalty accounts to change the rules or tokens that customers are entitled to. Assembling an accurate chain of custody for redemption-related data is made easier with the traceability function. The operational openness, visibility, and traceability of every earned loyalty point can be traced back to its source. Tokens, in contrast to conventional paper-based incentive schemes, have no expiration date. As a result, conventional loyalty programs no longer have to worry about their reward points expiring [14, 15]. The use of smart contracts in conjunction with blockchain technology may help member airlines of an alliance distribute loyalty points, redeem them, and cost-effectively split income while adhering to agreed-upon terms and conditions.

The aircraft sector may be able to benefit from blockchain technology by digitizing aircrew certificates in order to address the concerns raised above [16] [17]. Individuals may access and verify their credentials in real time using blockchain technology, which reduces the amount of time and effort required to do so. In the same way, the traceability aspects of blockchain technology may be used to eradicate any disparities in data and create confidence among aviation sector players. Crew certification may be authenticated on the blockchain to reduce the risk of fraudulent certificates and plane crashes.

Passenger luggage and aero planes may be tracked using information and communication technology (ICT). The use of blockchain technology may enable an airline firm to update the ledger in a transparent and secure manner when these assets are transferred from one owner to another. Blockchain technology, for example, records all shipment products, monitoring sensors, transporters, and shippers on the blockchain platform in order to digitize cargo transportation [18].

Using blockchain technology, aviation stakeholders may have a single and transparent view of aircraft's historical data and records. The FAA is able to give an aircraft's airworthiness score because of the logbook's openness. The aircraft's reputation and market worth suffer when its maintenance history is lacking. There are several ways in which the immutable blockchain technology might be used by a buyer of an aero plane in order to check its airworthiness and health score.

Because of the ease with which an individual's identity may be fabricated and misused, centralized systems are insecure. The technologies used to identify, authenticate, and authorize entities to access certain services are referred to as "identity management" [19]. After a successful authentication check, the entities' access requests are permitted to transact on the blockchain. To ensure that registered entities' credentials are secure, blockchain records can't be changed.

4. Conclusion

The Blockchain technology moves data nodes and data streams from one informatics center to another based on the value of Bitcoins, resulting in a dedicated, public, and secure network for interpreting and developing the ensuing information chain response. Blockchains are frequently formed by connecting interrelated patterns of information in order to conduct a secure transaction. Blockchain has the characteristics of decentralization, transparency, immutability, autonomy, open-source, anonymity, and consensus. Block chains are being utilized in a variety of real-world applications, including business and economics, financial technology, and digital currencies. A better tool for shaping the air transportation offering and allowing airports to become "smart airports" may be found in Blockchain networks. This article demonstrates that Blockchain may be used in many aviation sectors and is protected against malicious attacks, providing security and immutability.

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