

Blockchain Drones

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Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Accredited with 'A++' Grade by NAAC

DEPARTMENT OF INFORMATION TECHNOLOGY

IT- BULLETIN

February - 2024

BLOCKCHAIN DRONES

Welcome to the edition of the IT-BULLETIN on Blockchain Drones!

In this monthly publication, we bring you the latest news, trends, and developments in the exciting Words of Blockchain Drones



1). Introduction:

Blockchain technology, primarily known for underpinning cryptocurrencies like Bitcoin and Ethereum, is now making significant strides in revolutionizing various industries, including the rapidly evolving drone sector. This powerful combination of blockchain and drones is forging new paths in areas such as security, accountability, and automation. The decentralized nature of blockchain provides an ideal framework for drone operations, ensuring transparent, tamper-proof records of drone activities. This integration addresses many of the existing challenges in drone technology, such as secure communication, identity verification, and autonomous operations.

In the context of the drone industry, blockchain technology is being leveraged to create a new paradigm of operations. It enables a more secure and efficient method for recording and storing data collected by drones, enhancing trust and reliability in the data. Furthermore, blockchain facilitates the creation of smart contracts, allowing drones to operate autonomously in a regulated and compliant manner. This not only boosts efficiency but also opens the door to a range of applications, from agricultural monitoring to delivery services. The synergy of blockchain and drones represents a significant leap forward in both technologies, promising to deliver innovative solutions across various sectors.

2). Market Size

Blockchain technology is being integrated into various aspects of drone management, including flight authorization and control, data security and integrity, payment and transaction management, and supply chain tracking and authentication. The global blockchain drone market is expected to reach a value of USD 1.63 billion by 2026, growing at a CAGR of 21.4% from 2021 to 2026.

4). Growth rate by region

North America is expected to be the largest market for blockchain drones in 2026, followed by Europe and Asia Pacific. The North American market is expected to grow at a CAGR of 18.9%

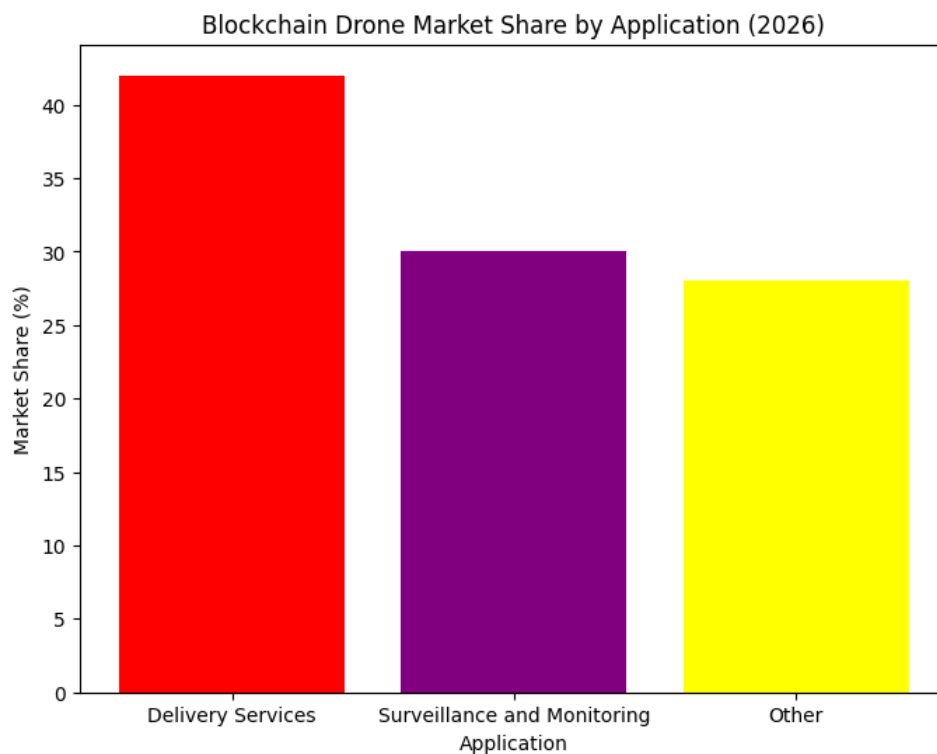
from 2021 to 2026, the European market at a CAGR of 23.2% from 2021 to 2026. The Asia Pacific market is expected to grow at a CAGR of 25.4% from 2021 to 2026.

North America: The United States is the largest market for blockchain drones in North America. The country is home to a number of leading companies in the blockchain drone industry, such as AirMap, FlytBase, and Skychain.

Europe: The United Kingdom, Germany, and France are the leading markets for blockchain drones in Europe. These countries have a strong regulatory foundation for drone operations, which is making it easier for companies to develop and deploy blockchain-based solutions.

Asia Pacific: China and Japan are the leading markets for blockchain drones in Asia Pacific. These countries are investing heavily in drone technology, and they are also home to a number of innovative companies developing blockchain-based solutions for drone operations.

4). Market Growth by Application



The delivery services segment is expected to be the largest market segment for blockchain drones in 2026, followed by the surveillance and monitoring segment.

The delivery services segment is expected to grow at a CAGR of 46% from 2021 to 2026.

The surveillance and monitoring segment is expected to grow at a CAGR of 28% from 2021 to 2026.

5). Architecture of Blockchain Drones

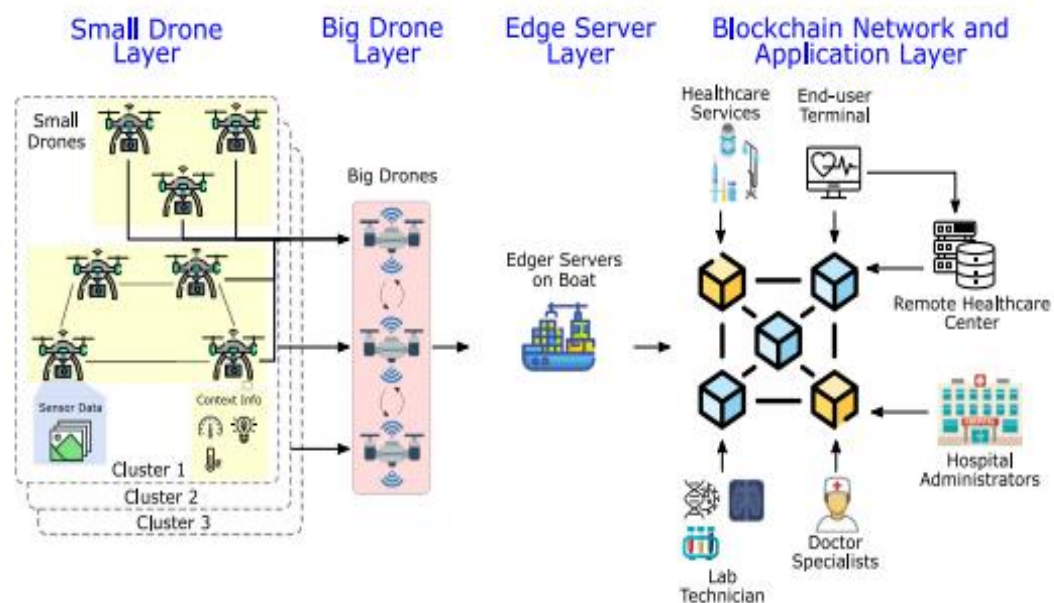


Diagram depicting the overall architecture of blockchain drones

In the IoD architecture, the small drone layer plays a pivotal role, comprising resource-constrained devices equipped with diverse cameras and sensors, including GPS, RGB, thermal cameras, and, optionally, Lidar for specialized applications. Operating with low battery, memory, and processing capabilities, these small drones employ lightweight computing boards like Raspberry Pi 4 or Jetson Nano for efficient data processing. Communication is facilitated through Wi-Fi modules, enabling high-speed data transmission of high-resolution videos to big drones in the network. Security measures include solid passwords, WPA3, and cryptographic primitives like **AES-256 and ChaCha20**. After Search and Rescue (SAR) missions, passwords are regularly updated to enhance security. The small drones can fly at varying altitudes, with a recommended height of 50–100 meters for adequate Wi-Fi signal strength and reliable object detection in captured images. Clusters, comprising several small drones and a big drone as a cluster head, are formed for SAR missions, allowing flexibility in adjusting the number of small drones based on mission requirements. These clusters cover specific areas using predefined flying plans, such as circular patterns, providing an efficient approach to search area coverage.

The big drone layer in the architecture features drones with robust capabilities, carrying heavier loads and equipped with high-resolution RGB and thermal cameras. These drones use powerful embedded boards for advanced edge services. Communication involves stringent security measures, including strong passwords, WPA3, and MAC address whitelists. Big drones can act as edge devices or monitors in SAR missions, automatically searching for persons and verifying detection results. They continuously monitor small drones, triggering alarms and requests to edge servers in case of malfunctions, ensuring efficient mission execution. The reliability of the drone network is enhanced through these security measures and monitoring mechanisms.

The edge server layer, situated on SAR boats or helicopters, is a vital hub with significant computational capabilities. It runs complex algorithms, supports data storage, processing, and compression, and connects big drones with cloud servers. In the context of blockchain integration, edge servers serve as essential nodes, synchronizing and maintaining a unique blockchain. This blockchain acts as a public database, offering evidence for auditing and analyzing danger areas. In turn, rescue teams benefit from optimized tactics based on the system's analyzed data.

The blockchain network layer integrates cloud servers for global data storage, utilizing services from providers like Google, Amazon, or Microsoft. This layer supports diverse functions, including push notifications, data analytics, machine learning, and AI. Accessible through web browsers or mobile applications, the terminal application demands user authentication. Utilizing powerful servers as edge servers, the blockchain layer focuses on gaining consensus and ensuring conflict-free data storage. Employing consensus mechanisms like Raft in Hyperledger Fabric, it facilitates autonomous processes with various information, including smart contracts and drone data.

Blockchain-based SAR utilizes smart contracts, forming a transaction-based state machine that transitions system views based on inputs. This subsection discusses the network setup for Ethereum and Hyperledger Fabric, two prominent blockchain platforms, catering to diverse services in Search and Rescue (SAR).

The blockchain network consists of six virtual machines, evenly divided into three Orderers and three Peers, deployed on a machine identical to the Ethereum setup. To enhance reliability, three virtual machines are dedicated to Peer service, and three to Orderer service.

The blockchain layer employs Hyperledger Fabric, a permissioned blockchain, ensuring faster consensus and user confidentiality. Fabric's execute-order-validate architecture, key-value data model, certificate authority, and Raft consensus are utilized. In the smart contract design three contracts—Drone Object, Rescuer Team, and Hospital—facilitate decentralized applications. These contracts enable autonomous communication and decision-making among entities, such as big drones, rescuer teams, hospitals, and suppliers, ensuring efficient collaboration in various mission scenarios.

6). Applications of Blockchain Drones

Blockchain drones are unmanned aerial vehicles (UAVs) that use blockchain technology to store and manage data. This makes them tamper-proof and transparent, making them ideal for a variety of real-life applications, including:

- **Supply chain management:** Blockchain drones can be used to track the movement of goods throughout the supply chain, ensuring that they are not tampered with or counterfeited. This can help to improve food safety, reduce fraud, and increase transparency for consumers.

- **Logistics and delivery:** Blockchain drones can be used to deliver goods quickly and efficiently, especially in remote or difficult-to-reach areas. They can also be used to deliver time-sensitive items, such as medical supplies or emergency aid.
- **Agriculture and farming:** Blockchain drones can be used to monitor crop health, identify pests and diseases, and apply pesticides and fertilizers precisely. This can help to improve crop yields and reduce the use of chemicals.
- **Search and rescue:** Blockchain drones can be used to search for missing people and provide assistance in disaster zones. They can also be used to deliver medical supplies and other essential items to people in need.
- **Security and surveillance:** Blockchain drones can be used to monitor borders, track criminals, and prevent crime. They can also be used to inspect critical infrastructure and identify potential hazards.

Here are some specific examples of how blockchain drones are being used in the real world today:

- Walmart is using blockchain drones to track food products from the farm to the store. This helps to ensure that food is safe and fresh, and it also helps to reduce food waste.
- Amazon is testing blockchain drones to deliver packages to customers. This could revolutionize the delivery industry, making it faster and more efficient.
- The World Food Programme is using blockchain drones to deliver food and other essential supplies to people in remote and disaster-stricken areas. This is helping to save lives and alleviate suffering.
- The US Department of Defense is using blockchain drones to inspect critical infrastructure and identify potential threats. This is helping to keep the country safe and secure.

Blockchain drones are still in their early stages of development, but they have the potential to revolutionize a wide range of industries. As the technology continues to mature and become more affordable, we can expect to see blockchain drones being used in even more innovative and impactful ways in the future.

7). Transformative Ripples: Impact



The impact of Blockchain Drones is multifaceted and extends across various sectors:

- **Security and Trust:** Blockchain's cryptographic features enhance data security, mitigating the risks associated with unauthorized access and tampering. These fosters trust among stakeholders, encouraging broader adoption of drone technology.
- **Operational Efficiency:** Using smart contracts, Blockchain Drones automate processes, reducing manual intervention and enhancing operational efficiency. This is particularly relevant in industries like logistics, where swift and secure deliveries are paramount.
- **Supply Chain Transparency:** In agriculture and logistics, Blockchain Drones enable real-time tracking of products from the source to the destination. This transparency not only prevents fraud but also ensures the quality and authenticity of goods.
- **Environmental Impact:** Optimizing drone routes and operations using blockchain can lead to reduced energy consumption and carbon emissions. This aligns with global efforts to develop sustainable practices in the use of emerging technologies.

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