

Survey Report

On

“ Types of Blockchains and its real time use cases ”

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Submitted By:
Pisolkar Kunal Kiran

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ABSTRACT

Blockchain technology has revolutionized various industries by providing a decentralized, transparent, and secure method for conducting transactions and managing data. This report aims to explore the different types of blockchains, including public, private, consortium, and hybrid blockchains, highlighting their key characteristics, benefits, and limitations. Additionally, it delves into real-time use cases across various sectors such as finance, healthcare, supply chain management, and government services. By examining these practical applications, this report underscores how blockchain is reshaping business models and enabling more efficient, secure, and decentralized systems for future innovation. The findings emphasize the versatility of blockchain and its potential to address critical challenges in modern digital ecosystems.

INTRODUCTION

Blockchain technology, initially introduced as the underlying infrastructure for Bitcoin, has evolved far beyond its original scope. It is a distributed ledger system that ensures data integrity through cryptography, making it nearly impossible to alter past records without consensus from the network participants. This decentralized nature of blockchain eliminates the need for intermediaries, offering enhanced transparency, security, and efficiency.

Today, blockchain has diversified into various types, each suited for different applications based on the requirements of control, transparency, and scalability. These types include **public**, **private**, **consortium**, and **hybrid blockchains**. Each type comes with distinct advantages and limitations, making them appropriate for specific industries and use cases.

In recent years, blockchain's impact has expanded into sectors such as **finance**, **healthcare**, **supply chain management**, and **government services**, offering solutions to challenges such as fraud prevention, data security, and operational inefficiencies. This report examines the different types of blockchains and explores their real-world applications, providing a comprehensive overview of how blockchain is shaping modern technological landscapes.

TYPES OF BLOCKCHAIN

Blockchain technology is not a one-size-fits-all solution. Over time, different types of blockchains have emerged to meet the unique needs of various industries and applications. Each type varies in terms of accessibility, control, consensus mechanisms, and level of decentralization. Understanding these variations is essential for choosing the right blockchain architecture based on the specific requirements of a use case. Broadly, blockchains can be categorized into four major types: Public, Private, Consortium, and Hybrid blockchains.

1. Public Blockchain

A public blockchain is a completely decentralized, permissionless network where anyone can participate. These blockchains are open-source, and their governance is distributed across the network participants, making them highly transparent. Since anyone can read, write, or audit the data on the ledger, public blockchains are ideal for systems requiring high trust and transparency, like cryptocurrency platforms.

Key Features:

- **Decentralization:** No single entity has control over the network.
- **Permissionless:** Anyone can join the network, create transactions, and participate in the consensus process.
- **Security:** Secured using consensus mechanisms such as Proof of Work (PoW) or Proof of Stake (PoS), public blockchains are resistant to censorship and manipulation.
- **Transparency:** All transactions are visible to anyone, promoting transparency and trust.

Use Cases:

- **Bitcoin** and **Ethereum** are the most well-known examples of public blockchains, where users can engage in peer-to-peer transactions without the need for intermediaries like banks or financial institutions.
- **Decentralized Finance (DeFi)** applications, **non-fungible tokens (NFTs)**, and **smart contracts** rely on public blockchains to ensure open participation and verifiable trust.

Despite its benefits, public blockchains face challenges such as **scalability** and **energy consumption** due to the intensive resources required for consensus mechanisms like PoW. This makes them less suitable for enterprise use cases requiring high throughput and efficiency.

2. Private Blockchain

A private blockchain, as the name suggests, operates in a controlled environment where only authorized participants are allowed to join the network. Unlike public blockchains, private blockchains are permissioned and often governed by a single organization or a consortium of entities. This centralized approach allows for more control over the network and better scalability, making them attractive for enterprise use.

Key Features:

- **Permissioned Access:** Only a select group of participants are granted access to the network.
- **Centralized Governance:** Typically controlled by one organization or a group of trusted parties.
- **Improved Efficiency:** With fewer participants and a more centralized consensus mechanism, private blockchains tend to have faster transaction speeds and lower energy consumption.
- **Privacy:** Transactions can be kept private within the network, which is beneficial for businesses dealing with sensitive information.

Use Cases:

- **Supply Chain Management:** Companies use private blockchains to track the origin and journey of goods, ensuring transparency and efficiency without exposing sensitive business information to the public.
- **Financial Institutions:** Banks and financial service providers use private blockchains for internal auditing, cross-border payments, and settlement of transactions, allowing for fast, secure, and private transactions.

While private blockchains offer better control and scalability, their centralized nature can compromise some of the trust and security benefits typically associated with blockchain technology. This makes them less transparent than public blockchains.

3. Consortium Blockchain

A consortium blockchain (also known as federated blockchain) sits between public and private blockchains. It is a permissioned system, but instead of being controlled by a single organization, a group of predefined entities or organizations jointly manages the blockchain. Consortium blockchains aim to deliver the benefits of decentralized decision-making while still maintaining a level of privacy and control.

Key Features:

- **Semi-Decentralized:** The control is distributed among a group of trusted parties rather than a single entity, providing a balance between decentralization and control.
- **Permissioned Access:** Only the selected entities are authorized to participate in the network.
- **Efficient and Scalable:** Like private blockchains, consortium blockchains tend to offer faster transaction speeds and better scalability compared to public networks.
- **Collaboration:** Multiple organizations work together, fostering trust among the participants.

Use Cases:

- **Banking Consortia:** A group of banks may collaborate on a consortium blockchain to manage and process cross-border transactions, allowing them to streamline processes, reduce transaction costs, and enhance security.
- **Healthcare:** A consortium blockchain can be used to share and manage patient data across hospitals, insurance providers, and government agencies, ensuring that data is secure and only accessible to authorized parties.

One of the main advantages of consortium blockchains is the shared governance structure, which reduces the likelihood of a single point of failure. However, it still requires the consortium members to maintain a high level of trust among each other.

4. Hybrid Blockchain

A hybrid blockchain combines elements of both public and private blockchains, allowing organizations to control which data is made public and which remains private. This type of blockchain offers selective transparency and combines the advantages of both worlds—public decentralization and private control. Hybrid blockchains allow for flexible governance while still maintaining high security and privacy standards.

Key Features:

- **Customizable Transparency:** Organizations can choose which part of their data or transactions should be public and which should remain private.
- **Flexible Governance:** Control over the blockchain can be partly centralized (private) while leveraging the decentralized features (public) when needed.
- **Security and Privacy:** Hybrid blockchains offer a highly secure environment while still providing transparency for certain aspects of the network.

Use Cases:

- **Enterprise Blockchain Solutions:** Companies can use hybrid blockchains to manage internal operations while still allowing public verification of certain data, like auditing or regulatory reporting.
- **Government:** Governments can use hybrid blockchains to make public records like land ownership or citizen identification available to the public while keeping sensitive data private.

Hybrid blockchains are highly versatile and adaptable, making them an attractive option for industries requiring a balance between privacy and transparency. However, their implementation can be complex and requires careful planning to ensure that the right data is exposed to the public without compromising privacy.

APPLICATIONS OF BLOCKCHAIN

Blockchain technology has found its way into numerous industries, offering enhanced transparency, security, and efficiency. Its decentralized nature enables new ways of managing data and transactions. Below are some key real-time applications of blockchain:

Finance and Banking

Blockchain revolutionizes financial services through faster, secure, and low-cost transactions. It facilitates cross-border payments, smart contracts, and decentralized finance (DeFi) platforms, reducing reliance on intermediaries like banks. Cryptocurrencies like Bitcoin and Ethereum are prime examples of blockchain-driven financial innovations.

Supply Chain Management

Blockchain ensures transparency and traceability in supply chains. By tracking products from origin to consumer, companies can authenticate product quality, prevent fraud, and enhance operational efficiency. Solutions like IBM Food Trust help manage the food supply chain securely and transparently.

Healthcare

In healthcare, blockchain is used for secure management of medical records, ensuring that patient data is shared only with authorized entities. It also enhances drug traceability to prevent counterfeit medications. Platforms like MediLedger facilitate secure data exchange between pharmaceutical companies.

Government and Public Services

Governments use blockchain to provide secure digital identities, voting systems, and land registry management. Blockchain-powered land registries prevent tampering with ownership records, while digital identity systems streamline citizen services and reduce fraud.

Real Estate

Blockchain simplifies real estate transactions by facilitating transparent property transfers through smart contracts. It reduces paperwork, speeds up processes, and ensures tamper-proof ownership records.

CONCLUSION

Blockchain technology has proven to be a groundbreaking innovation, offering a decentralized, transparent, and secure way to manage data and transactions. From its origins in cryptocurrency to widespread adoption across industries such as finance, healthcare, and supply chain management, blockchain is reshaping traditional business models and processes. With multiple types of blockchains—public, private, consortium, and hybrid—organizations can choose the architecture that best fits their specific needs. As the technology matures, its real-time use cases continue to expand, promising further advancements in data integrity, security, and efficiency. Blockchain’s potential to revolutionize industries is undeniable, and its adoption will likely continue to grow in the years to come.