Introduction to

Web 3.0

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What is Web 3.0?

The World Wide Web (WWW or Web) has gone through several stages of development since its inception in 1990s. The evolution of the web has led to an expansion of capabilities and potential uses.

Web 1.0	Web 2.0	Web 3.0
The first stage of the web that started in 1990s.	The second stage of the web that started in 2000s.	The next evolution of the web and still in the early stages of development.
Primarily used to share and access information rather than creating interactive and collaborative applications.	A shift from static, informational websites to more interactive and dynamic ones.	Allowed users to own and manage digital assets in a decentralized manner.
Mostly static websites with little or no user interaction.	Allowed users to participate and interact on the web with the development of social media platforms, user generated websites, and more.	Enabled the creation of decentralized applications (dApps) that operate without the need for intermediaries.
Read	Read Write	Read Write Own

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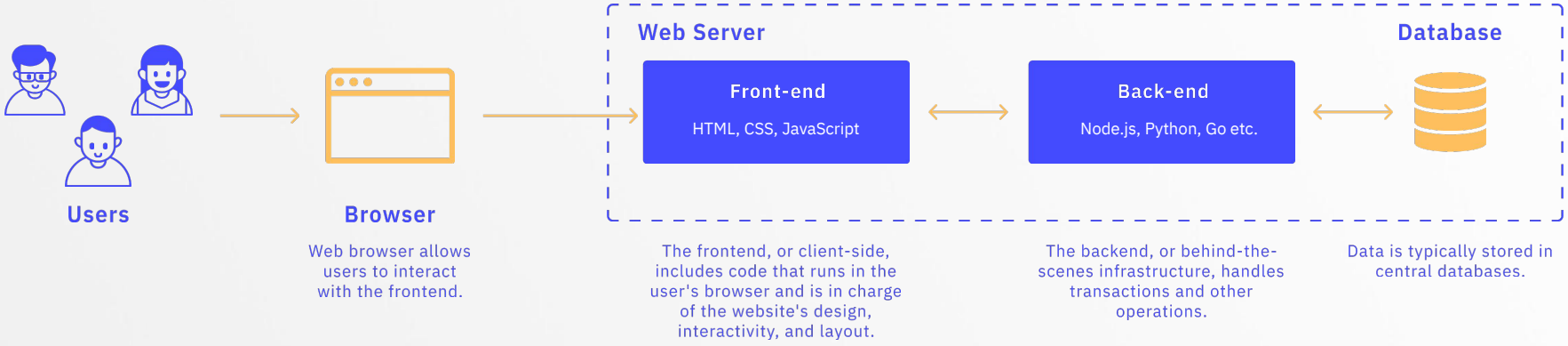
Web 2.0 vs Web 3.0: A Closer Look at Web 2.0

Starting from 2000s, Web 2.0 has enabled more participation and interaction on the web through dynamic web-pages, interactive and collaborative applications.

This resulted in the development of new technologies, advanced websites, and an enhanced user experience, where users could share and create content in addition to consuming it.



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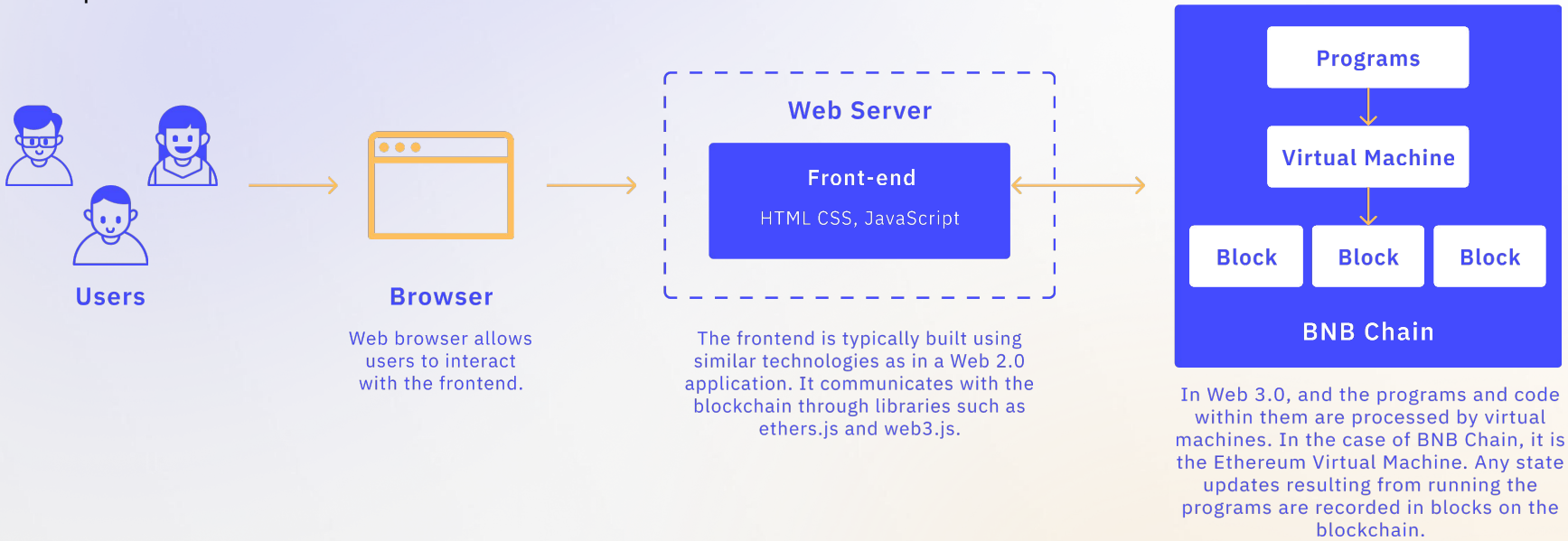
Web 2.0 vs Web 3.0: A Closer Look at Web 3.0

The key difference between Web 2.0 and Web 3.0 is the backend infrastructure they use. In Web 3.0, the backend infrastructure utilizes decentralized and distributed systems, achieved through the use of blockchain technology for data storage and management, rather than relying on a central database. This approach aims to increase security and reduce the dependence on centralized services.



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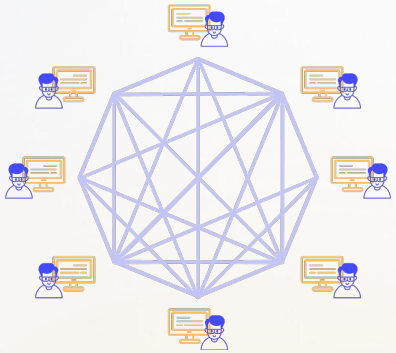
Decentralization

Web 3.0 is decentralized compared to Web 2.0 because it relies on distributed systems and peer-to-peer networks, rather than centralized ones.

Web 2.0

The majority of data and resources are stored in central databases controlled by a small number of large companies. These companies have significant control over the data that users access and share.

Web 3.0

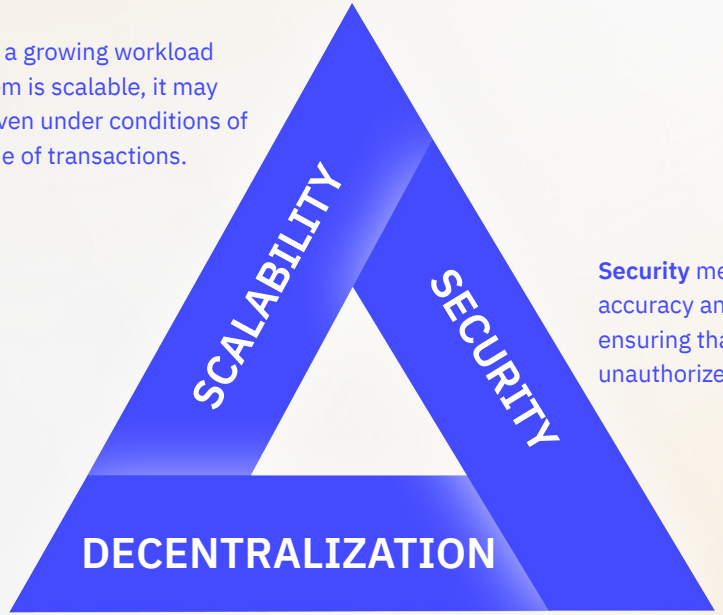


Data and resources are distributed among many different actors. By doing so, Web 3.0 aims to increase security, reduce the risk of data breaches, and make the web more open and accessible to all.

The Blockchain Trilemma

Designing and implementing a blockchain system often involves a trade-off between scalability, decentralization, and security, as it can be challenging to optimize for all three concurrently.

Scalability is the capacity of a system to handle a growing workload without deteriorating in efficiency. When a system is scalable, it may continue to function effectively and efficiently even under conditions of high utilization or demand, such as a high volume of transactions.



Security measures are implemented to protect the accuracy and privacy of data stored on the blockchain, ensuring that it cannot be easily altered or accessed by unauthorized parties.

Decentralization is the process of distributing authority and control away from a centralized authority. It is achieved by the large number of computers running on the network. Decentralization is important to prevent data on the network from being manipulated by an individual or group.

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Does the Perfect Blockchain exist?

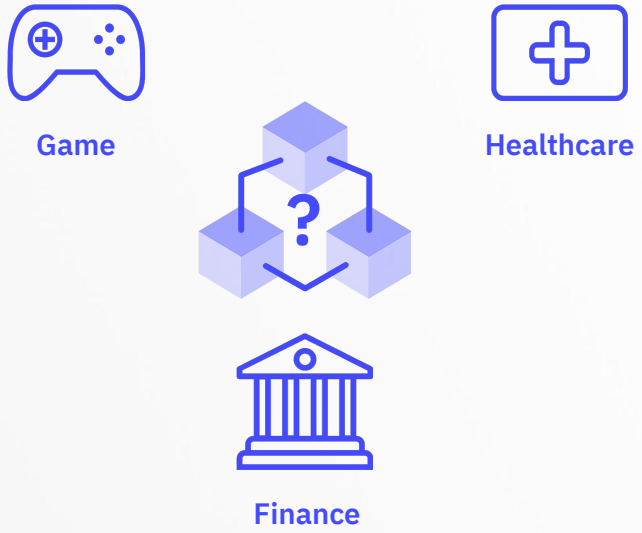
In time, many different types of blockchains have been developed to address different types use cases. It would be unrealistic to expect one blockchain to be applied to all use cases and industries, because:

Every industry has its own unique characteristics, such as the type of data that needs to be stored, the level of security required, and the scalability needed.

Blockchains have different technical features, such as consensus mechanisms, transaction speeds, and architecture.

These differences give blockchains a variety of capabilities as discussed under the ‘Blockchain Trilemma’. Some blockchains may not be able to process large volumes of data quickly enough, while others may not be able to provide the level of security required for sensitive applications.

So, a single blockchain would not be able to support all kinds of applications at maximum performance.



Does the Perfect Blockchain Exist? Sidechains

As a solution, customized side-chains can be developed on top of main blockchains to meet the specific needs of different use cases. In this way, sidechains take advantage of the security and decentralization of the main chain, while also allowing for the development of new and unique features that may not be possible on the main blockchain.

Use cases

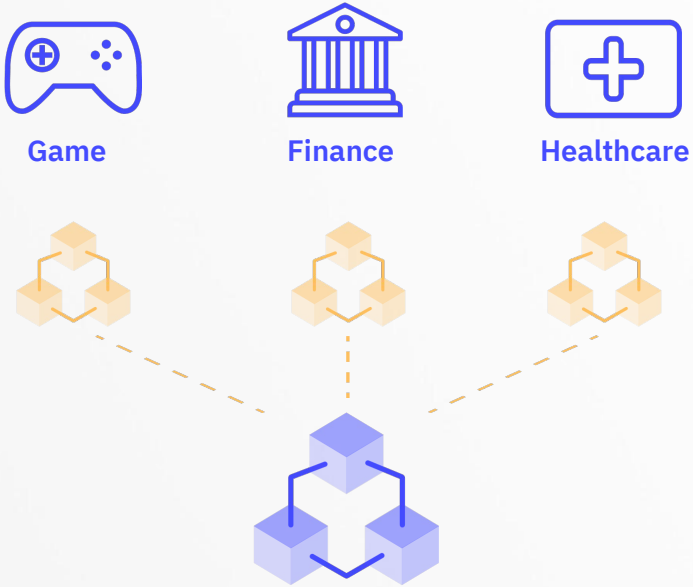
For example, a sidechain for a gaming application may prioritize scalability, while a sidechain for a finance or healthcare application may prioritize security.

Sidechains

Considered to be a ‘Layer 2’ solution. It uses the underlying blockchain structure of the main chain.

Main blockchain

Considered to be the ‘Layer 1’ blockchain.



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Decentralized Applications:

An Introduction

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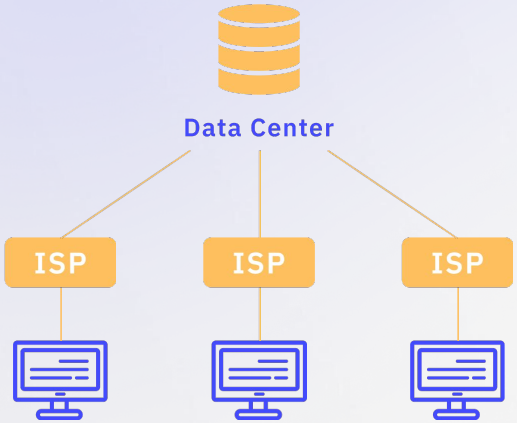
Decentralized vs. Centralized Applications

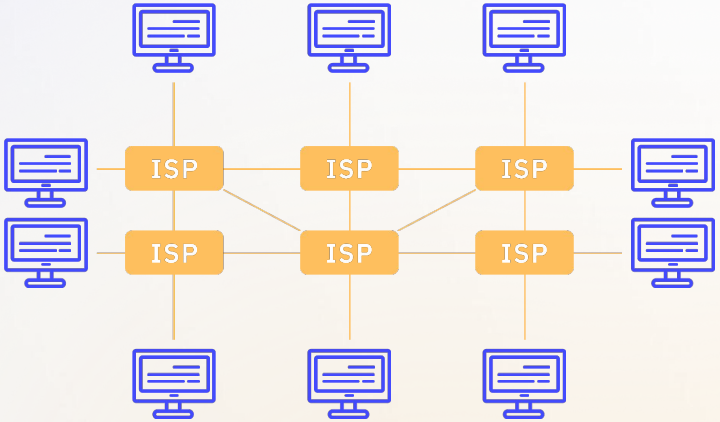
Centralized applications (apps) rely on a central server or authority to function and manage data. On the other hand, decentralized applications (dApps) are applications that run on a decentralized network and uses blockchain to manage and process data. This means that dApps do not rely on a central point of control or authority.

ISP: Internet Service Provider

Centralized Apps



Decentralized Apps



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Decentralized vs. Centralized Applications

Centralized apps

Rely on a central server or authority.

Can handle large amounts of data and perform complex operations more efficiently due to the concentration of all processing power in a single location.

Easier to develop and maintain, as all the data and logic is controlled by a single entity.

Easier to implement security measures and control access to data; but Potentially more vulnerable to security breaches due to a single point of failure.

Decentralized apps

Run on a decentralized network and use blockchain technology.

Data access might be slower, as it needs to be accessed via a distributed network.

More complex to develop and maintain, as they rely on a decentralized network and blockchain technology.

Data is considered to be more secure and resistant to tampering or failure.

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Advantages and Disadvantages of dApps

Advantages

- Decentralization
- Security
- Accessibility
- Incentivizing Users

Disadvantages

- User Experience
- Lack of Regulation
- Privacy Issues
- Scalability Issues

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Advantages of dApps

Decentralization:

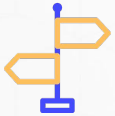
The decentralization of dApps allows them to operate independently from central authorities.

Users have control over their assets. External intervention on user assets is not possible.

Security:

The failure of one or a few of the computers that make up the decentralized system is not sufficient for the system to malfunction.

This makes dApps more secure than centralized applications.



Accessibility:

dApps can be accessed from all over the world as they run on decentralized networks that can be accessed from anywhere with an internet connection.

They are designed to provide uninterrupted service by utilizing the decentralized nature of the blockchain technology.

Incentivizing Users:

dApps often incentivize their users to participate in their network. These incentives are designed to align the interests of users.

Some incentives include token rewards, allowing users to participate in governance, and supporting developers to build on their platform by offering rewards, grants or bounties.

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Disadvantages of dApps

User Experience:

dApps are still in an early stage of development, it could take time for users to adapt to using decentralized systems and for the technology to be widely adopted.

The use of dApps may require technical knowledge such as how to use a cryptocurrency wallet, which can be a barrier for some users.

Lack of Regulation:

Incomplete legal regulations and uncertainties regarding blockchain technology may negatively impact user confidence in the dApp ecosystem.

Some dApps may have limited support or none at all. This can make it difficult for users to get help if they encounter any problems.

Privacy:

Due to the transparency of blockchains, transactions and data can be visible to anyone on the network. This could be a concern for users who want to keep their data private.

Immutability of data may be problematic for sensitive information, such as personal data.

Scalability Issues:

The ability to scale is currently a concern as the blockchain network needs to handle the increased usage.

Building a dApps requires specialized expertise and resources which may not be available to every developer.

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Blockchain Use Cases

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Retail

Some ways that blockchain technology can be used in the retail industry include:

Potential Use Cases

- Inventory and product traceability: Real-time traceability of inventory and product movements from origin to consumer.
- Customer loyalty programs: Secure and tamper-proof customer rewards and points.
- Identity and access management: Secure authentication and access control for employees, suppliers, and customers.
- Data sharing and interoperability: Secure and transparent data sharing among different stakeholders.
- Anti-counterfeit measures: Secure tracking of products to prevent counterfeiting.

Real Life Example

Walmart Canada has been using DL Freight, a blockchain network, for the past two years as a single source of truth for all network participants. Invoice disputes decreased by 70 times after its implementation.

Manufacturing

Some ways that blockchain technology can be used in manufacturing include:

Potential Use Cases

- Quality control and assurance: Secure tracking of products to ensure quality and prevent defects.
- Maintenance and service: Secure tracking of maintenance and service records for equipment and machines.
- Inventory and product traceability: Real-time traceability of inventory and product levels.

Real Life Example

Odometer is a device that measures the distance a vehicle has traveled.
Odometer fraud results in the manipulation of the mileage on many vehicles.
To prevent this, Bosch connected a car to a blockchain to read its mileage data.

Financial Services & Banking

Here are some ways that blockchain technology can be used in the financial services and banking industry:

Potential Use Cases

- Faster and more efficient transactions: Making cross-border payments and other transactions faster and less costly thanks to peer-to-peer transactions.
- Improved settlement processes: Providing more efficient and secure way of clearing and settlement
- Enhanced security: Secure record keeping of financial transactions, and reduction of fraud and errors.
- Facilitating real-time auditing and monitoring

Real Life Example

- Wells Fargo and HSBC entered a strategic agreement to optimize settlement of foreign exchange transactions and reduce settlement risk.

Real Estate

Blockchain technology in real estate can be used in several ways:

Potential Use Cases

Digital records of property ownership: Tamper-proof records of property helping to improve the efficiency and security of ownership transfer, as well as reducing the need for intermediaries.

Fractional ownership: Tokenization of real estate enabling fractional ownership, making it more accessible for individuals to invest in properties.

Automation: Smart contracts automating the process of buying and selling real estate, reducing the need for intermediaries and increasing transparency.

Real Life Example

A city in Vermont, U.S. implemented a pilot study to test to the blockchain technology on recording real estate sales. One of our goals is to eliminate title insurance need and make the title transfer secure.

Education

Potential use cases of blockchain technology in the education sector include:

Potential Use Cases

Digital credentialing: Enhancing security, transparency, and portability of educational credentials.

Data sharing and collaboration: A secure and faster way of sharing student information, such as grades and attendance records, between different educational institutions.

Real Life Example

The University of Bahrain started issuing digital diplomas to make it easier for graduates to share their educational credentials with employers, and for employers to verify the authenticity of the diplomas in a secure and transparent manner.

Legal Industry

Some ways that blockchain technology can be used in the legal industry include:

Potential Use Cases

- Smart contracts: Automating legal agreements using blockchain-based smart contracts.
- Document management: Securely storing and sharing legal documents.
- Intellectual property (IP): Registering and protecting IP rights using blockchain technology.
- Identity verification: Authenticating and verifying identity of parties using digital identities for remote legal proceedings.

Real Life Example

- OpenLaw is a blockchain-based platform that uses smart contracts to automate the creation, execution, and management of legal agreements.

Insurance

Some potential applications of blockchain technology in the insurance industry include:

Potential Use Cases

- Claim processing: Automating the claims process using blockchain-based smart contracts.
- Fraud detection: Detecting and preventing fraud using blockchain's immutability and transparency.
- Identity verification: Verifying the identity of policyholders and providers.
- Reinsurance: Automating reinsurance contracts using blockchain, reducing operational costs and increasing efficiency.

Real Life Example

Allianz uses an enterprise blockchain platform with 24 European subsidiaries to streamline cross-border auto insurance claims.

Healthcare

Some potential use cases of blockchain technology in the healthcare industry include:

Potential Use Cases

- Secure medical records: Secure, tamper-proof and transparent storage of electronic medical records (EMR).
- Identity and access management: Secure authentication and access control for patients, doctors, and other healthcare professionals
- Medical billing and claims management: Secure and transparent management of medical billing and claims.
- Medical research: Secure and transparent sharing of medical research data among researchers and institutions.

Real Life Example

Aetna, a U.S.-based health insurance company, is experimenting with a blockchain-based system that enables the exchange of databases, handling claims and payments, and keeping directories.

Public Sector

Potential use cases of blockchain in the public sector include:

Potential Use Cases

- Digital identity management: Creating safe and unchangeable digital identities for people, companies, and organizations.
- Electronic voting systems
- Land and Property Management: Systems for the safe and transparent registration and transaction of real estate.
- Management of taxes and benefits: Systems that are secure and transparent for disbursing benefits and collecting taxes.

Real Life Example

The Republic of Estonia has implemented a blockchain-based digital identity system to improve the security and efficiency of its public services.

Evaluating Blockchain for Your Business

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Blockchain Challenges

Blockchains offer advantages such as transparency, immutability, and security, but also present several challenges. These challenges need to be considered when evaluating the suitability of blockchain technology for a business use case:

Interoperability

Interoperability is the ability of different blockchains to communicate and interact seamlessly, such as transferring a digital asset between the Ethereum and BNB Chain.

Using different structures make it hard for blockchains to interact and share data. Closed systems of businesses also limit integration with other systems, making it difficult for businesses using blockchain technology.

Regulation

As blockchain technology and cryptocurrencies are relatively new innovations, laws and regulations have not yet fully caught up to the developments in this field. This can create a legal grey area and presents a range of risks for both individual users and businesses operating within the blockchain ecosystem.

Adoption

Since the use of blockchain-based applications is not very common yet, some new users may have trouble adapting to this process.

Users who do not know or have limited knowledge of blockchain-based technologies can be the target of fraudsters.

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Blockchain Challenges

Blockchains offer advantages such as transparency, immutability, and security, but also present several challenges. These challenges need to be considered when evaluating the suitability of blockchain technology for a business use case:

Lack of Standardization

Multiple blockchain protocols with distinct characteristics pose challenges for organizations. It can be difficult to predict which platform will be preferred in the long term, making it hard for companies to decide which blockchain technology to invest in.

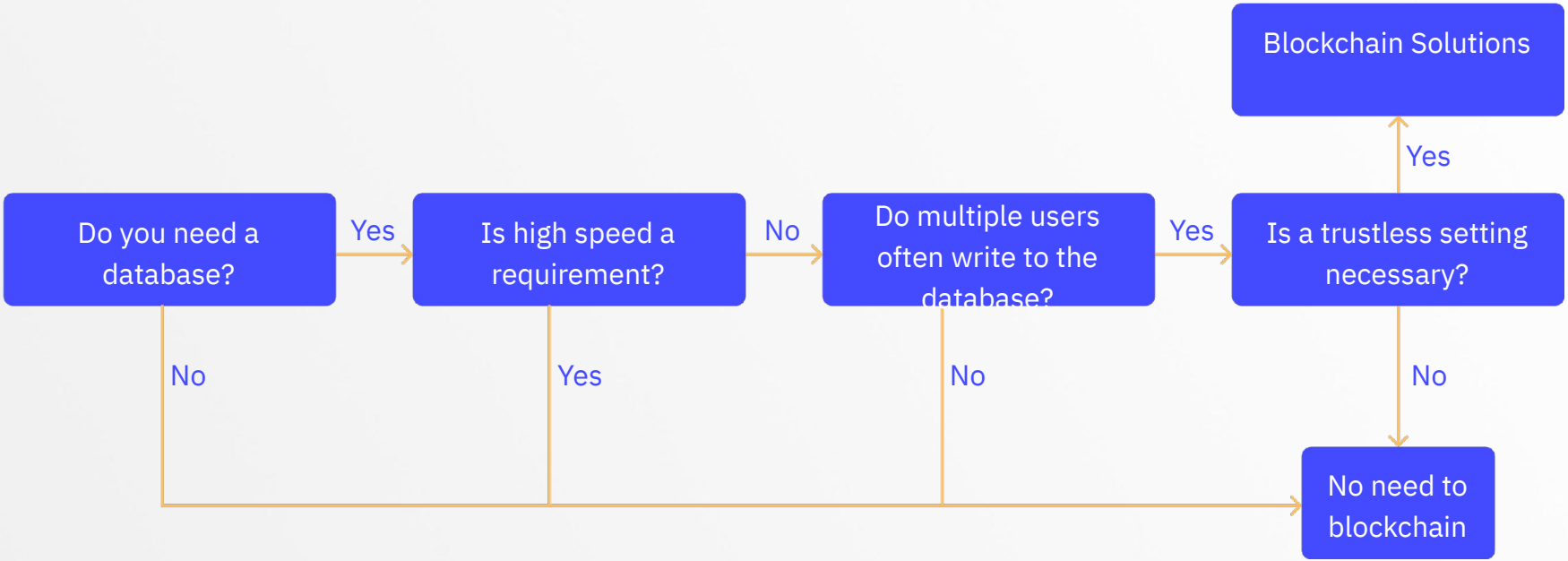
Privacy

The traceability and transparency of blockchains can potentially allow for the linking of transactions to specific individuals or entities by using various techniques such as transaction clustering, address clustering and timing analysis.

Transaction Fees

Transaction fees compensate nodes that validate and record transactions. These fees are usually paid by the sender but can become too high during periods of high demand, making the use of blockchain less attractive or too costly for some users. Some individuals or organizations may prefer centralized alternatives as a more cost-effective solution.

Do You Really Need A Blockchain?



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