Seminar
E-Customs at the heart of Trade Facilitation

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HARNESSING BLOCKCHAIN FOR E-CUSTOMS: PROSPECTS AND CHALLENGES

AGENDA

01 The blockchain technology

02 Blockchain applications

03 Blockchain applications in trade

04 Potential long-term impact

05 Harnessing blockchain

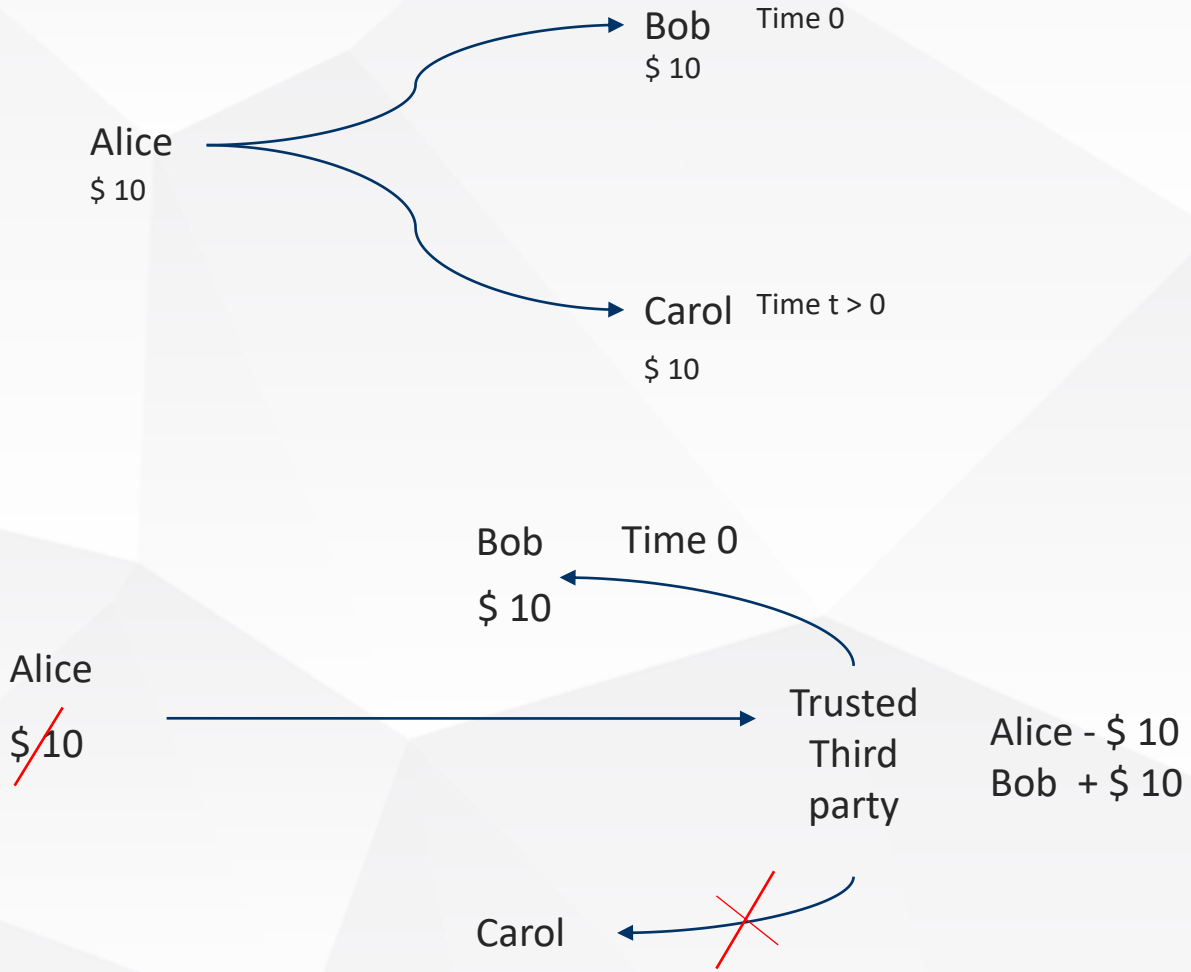
The Blockchain Technology

Bitcoin: A Peer-to-Peer Electronic Cash System

Satoshi Nakamoto
satoshin@gmx.com
www.bitcoin.org

Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

The double-spending problem

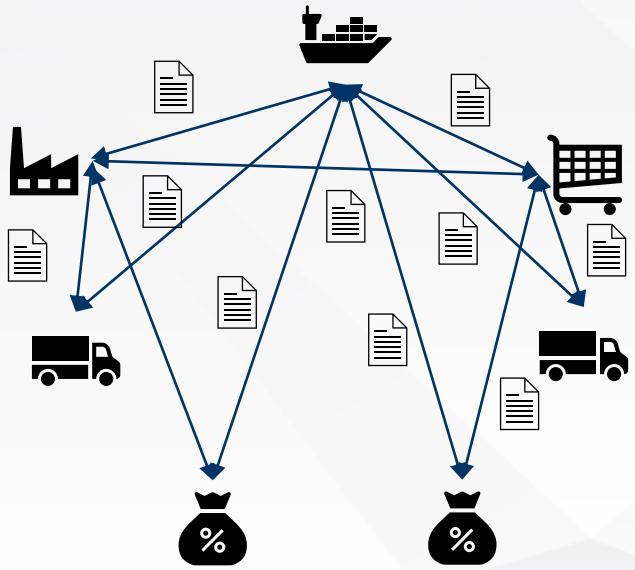


The Blockchain Technology

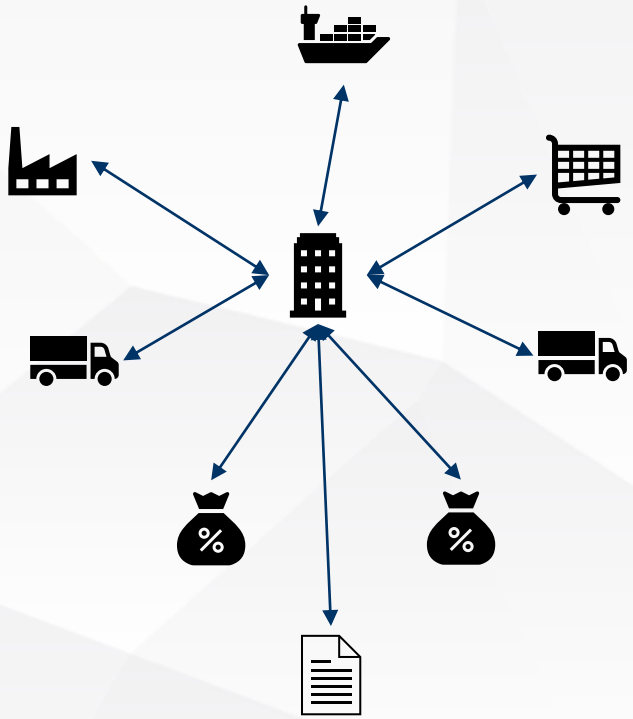
Digitalize the content and the paper

The Blockchain Technology

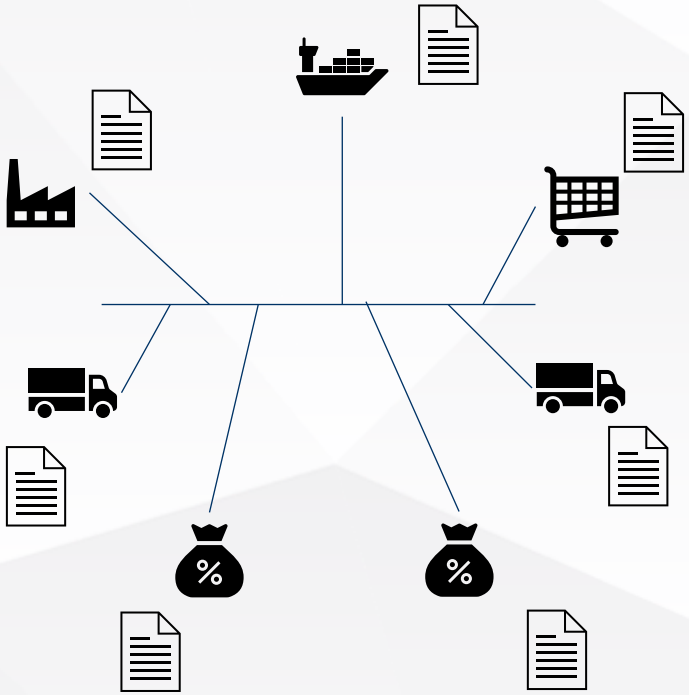
Blockchain is a technology to build and maintain a distributed, tamper-evident, validated, and secured **digital ledger**



Paper-based & digital



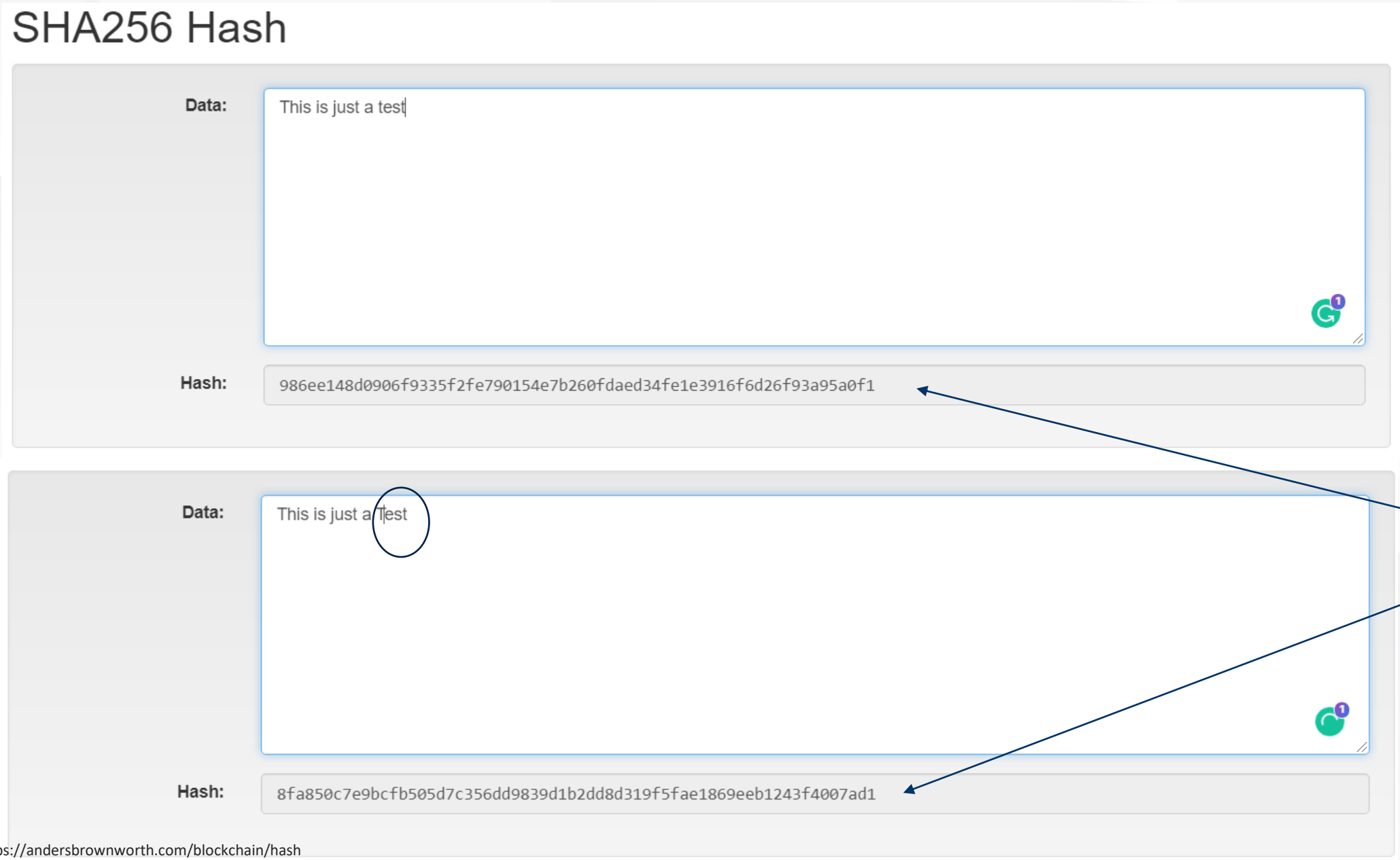
Digital centralized



Digital distributed

The Blockchain Technology

https://andersbrownworth.com/blockchain/hash



Any change in the input generates a completely different hash

Source: https://andersbrownworth.com/blockchain/hash

The Blockchain Technology

Block

Block:	#	1				
Nonce:						
Tx:	$	25.00	From:	Darcy	->	Bingley
	$	4.27	From:	Elizabeth	->	Jane
	$	19.22	From:	Wickham	->	Lydia
	$	106.44	From:	Lady Cath	->	Collins
	$	6.42	From:	Charlotte	->	Elizabeth
Prev:	0000000000000000000000000000000000000000000000000000000000000000					
Hash:	de4742352d69872d165e4d4754d3dfca5b80fbcbc26c8d6a00					

Mine

Block:	#	1				
Nonce:	139358					
Tx:	$	25.00	From:	Darcy	->	Bingley
	$	4.27	From:	Elizabeth	->	Jane
	$	19.22	From:	Wickham	->	Lydia
	$	106.44	From:	Lady Cath	->	Collins
	$	6.42	From:	Charlotte	->	Elizabeth
Prev:	0000000000000000000000000000000000000000000000000000000000000000					
Hash:	00000c52990ee86de55ec4b9b32beefd745d71675dc0eddfbc					

Mine

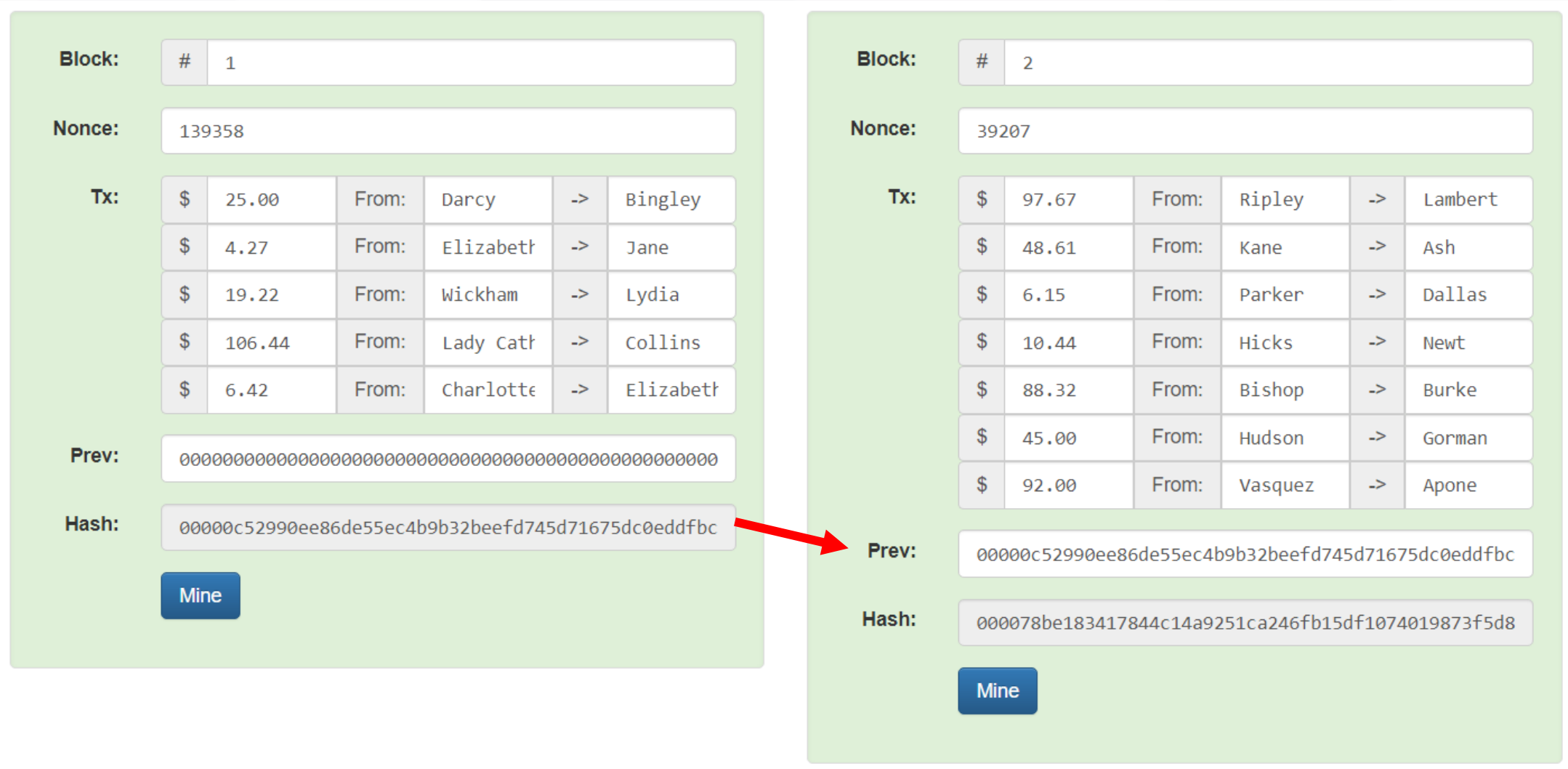
Miners try to find a number (NONCE) that will make the hash start with 5 zeros

Source: https://andersbrownworth.com/blockchain/tokens

The Blockchain Technology

https://andersbrownworth.com/blockchain/tokens

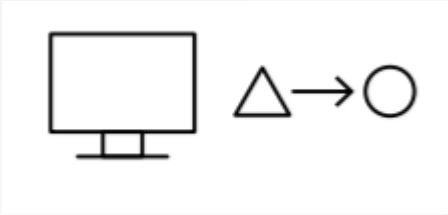
Blockchain



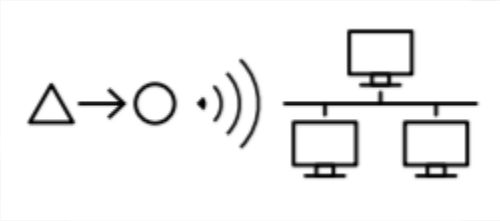
Source: https://andersbrownworth.com/blockchain/tokens

The Blockchain Technology

1 Transaction is submitted to a blockchain

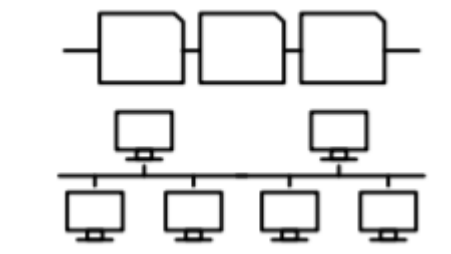


2 Network receives the transaction



3 New block created and propagated

4 Blockchain updated and transaction completed



Source: UNIN (2019), A Practical Guide to Using Blockchain within the United Nation, available at https://atrium.network/guide

The Blockchain Technology

	Permissionless	Permissioned
Public	Anyone can send and validate the transactions Example: Bitcoin	Anyone can send transactions but only those who meet an established criteria can validate the transactions
Private	Members of the consortium can send and validate the transactions	Members of the consortium can send transactions but only those who meet an established criteria can validate the transactions

The Blockchain Technology

Cryptocurrency

The foundation of blockchain technologies

Cryptocurrency blockchains

Peer-to-peer decentralised cryptocurrency transactions

Proof-of-work (PoW) protocol

BLOCKCHAIN 1.0

Smart Contracts

More financial functionality than simply being a cryptocurrency transactions processor

Decentralized applications (DApps) based on programmable language

Autonomously executing algorithms

Proof-of-work (PoW) protocol

BLOCKCHAIN 2.0

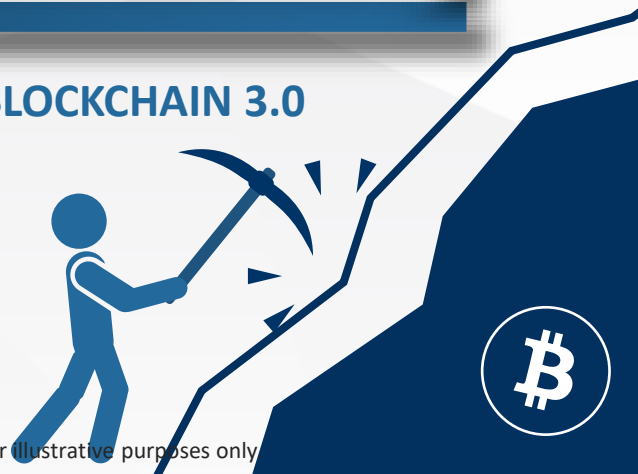
More Functionality

Larger-scale of applications of non cryptocurrency-related Distributed Ledger Technology (DLT)

Improved performance with more scalability and interoperability.

Proof-of-stake (PoS) protocol

BLOCKCHAIN 3.0



Blockchain's Ecosystems of Innovation

Example: Zero-knowledge proof (ZK-Proof) systems

Cryptographic innovations

Innovations in algorithm, blockchain, mathematical models, etc

HYPERLEDGER

Layer 1 software infrastructure

Reduce the required crypto skills to program and reduce the risk of faulty crypto implementations

DeFi, International trade, value chains, etc

Layer 2 software infrastructure

Decentralized version of an existing centralized application or system

Hardware

Hardware infrastructure to support the applications

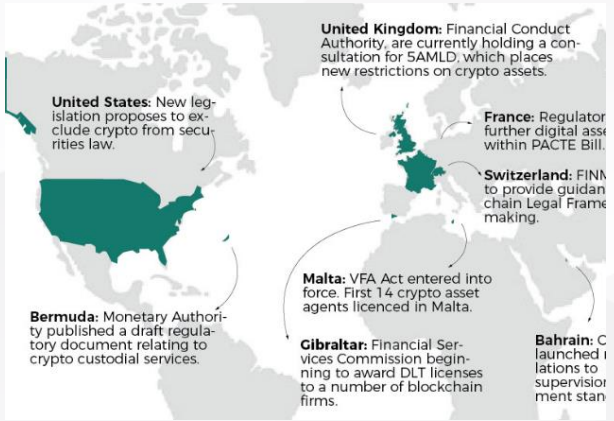
API3 Dash

Governance and business models

Governance mechanisms and business models of blockchain solutions, e.g. DAO

Innovations in regulations

Many adjustments are needed in terms of institutions and regulations.

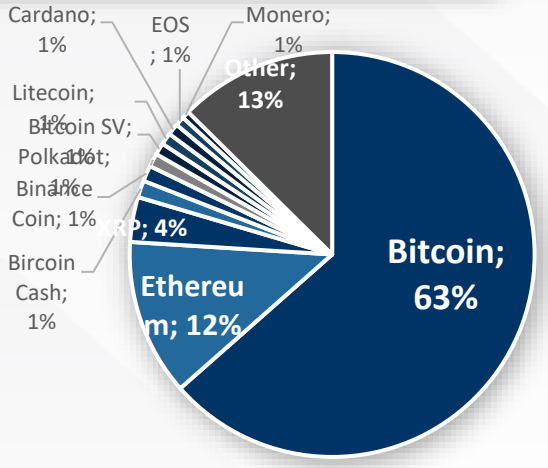


https://www.e-zigurat.com/

Blockchain Applications

Cryptocurrencies and online payments

- Over **6,000 cryptocurrencies**
- Total capitalization of over $ 2.5 trillion



Decentralized Finance (DeFi)

- Financial instruments run by **smart contracts**
- Complex financial use cases without any intermediaries
- In 2020 there were **251 DeFi projects**, 203 were built on Ethereum blockchain, and 26 on Bitcoin. **Examples:**

Chainlink LINK

Uniswap

International trade

Smart contracts allow for **automatic, speedy, and timely issuance of customs invoices, permits, licenses, and certificates triggered after payments of fees and duties**. Numerous companies and governments are already forming consortia and alliances to deploy the blockchain technology in various areas of international trade.

Value chain

Blockchain can be used to improve the **transparency, traceability and reliability** throughout the value chains by reducing information asymmetries, tracking inventories and ownership rights of products, enabling faster and more cost-efficient delivery of goods, and enhancing coordination between stakeholders.

HYPERLEDGER

Blockchain Applications in Trade

- Supply chain
  - Consignment and shipping data
  - Container logistics information and bills of lading
  - Permits and declarations
- Traceability
- Trade financing
  - Financing and insurance
  - Commercial invoice

Image Credits: cargox.io

TRADELENS

ASYCUDA world

Blockchain Applications in Trade

Normal document

Transferable documents

Authenticity
(any tampering would be evident)

Source
(genuine creators of documents)

Legality
(legally valid performance obligation transfer)

Source: based on presentation by Mr. Kay Ren Yuh, Senior Manger, Trade, INFOCOMM Media Development Authority, Singapore

Use cases in customs

Three main areas:

1. Using blockchain in customs duties
2. Exchanging trade documentation with other national agencies
3. Using blockchain for government-to-government exchanges

Two functions:

1. Transparency
2. Efficiency

Using blockchain in customs duties

Use cases:

1. Increasing transparency through information exchange
2. Facilitating and reducing the cost and time of customs operations by replacing paper-intensive tasks with relevant blockchain applications
3. Optimize the process of customs goods pre-arrival and their expedited release by real-time sharing of the relevant information
4. Automatic analysis and selection of customs documents based on some pre-determined criteria set in smart contracts

Requirements:

1. Active participation of importers, exporters and customs in different countries
2. Pre-installed base of digital components
3. Recognition of the technology by national governments

Exchanging trade documentation with other national agencies

Use cases:

1. Inter-agency exchange of other types of trade related documents such as: sanitary and phytosanitary certificates, certificates of origin (documents that assert that the goods in a specific shipment comply with the terms of a free trade agreement (FTA)), conformity assessment certificates, import and export licenses.
2. Importers and exporters can have immediate and easy access to the trusted information
3. Smart contract technology can be applied for certificate and license analysis by customs according to predefined criteria

Requirements:

1. Standards for the technology
2. Standards for data exchange.
3. Innovation process in parallel among national agencies
4. Legal framework of smart contract

Using blockchain for government-to-government exchanges

Use cases:

1. G2G information exchange between government agencies dealing with trade (customs, economic chamber of commerce, regulation agencies)

Requirements:

1. Standardization and trust in decentralised technologies' security
2. Sufficient number of stakeholders to take part in such a project
3. Legal framework in which technology is fully recognized at the international level
4. Universal standards, terminology and legal norms

Case study: Tradelens

- Data and document-sharing platform using blockchain
- Provide digital supply-chain visibility, collaboration and analytics tools (five of the six largest global ocean carriers involved)
- Products: TradeLens eBL and TradeLens Core
- The key process is digitalization
  - E.g. How Dutch wholesaler Van Den Ban eliminated $300,000 in detention and demurrage charges (https://www.tradelens.com/case-studies/eliminating-d-and-d-charges)
- For one firm to use Tradelens and really benefits, it has to bring all its partners along the value chain with them.
  - E.g. NKG, a European coffee importer is building a visible supply chain from inland Brazil (https://www.tradelens.com/case-studies/expediting-the-coffee-trade)
- For customs: help ensuring compliance
- Current coverage in the region:
  - Customs clearance event coverage: Abu Dhabi and Saudi Arabia
  - Inland depots: Dammam, Saudi Arabia (Kanoo Terminal Services)
  - Terminals: Al Hidd, Bahrain (APM Terminals), Aqaba, Jordan (APM Terminals), Doha, Qatar (Q terminals), Jeddah, Saudi Arabia (Red Sea Gateway), Jubail, Saudi Arabia (GSCCO-Jubail Terminal), King Abdullah Economic City, Saudi Arabia (King Abdullah- National Container Terminals), Salalah, Oman (APM Terminals)

Case study: TradeTrust

TradeTrust is a digital utility that comprises a set of globally-accepted standards and frameworks that connects governments and businesses to a public blockchain to enable trusted interoperability and exchanges of electronic trade documents across digital platforms.

Four components:

- Trade harmonization: Provide legal validity for electronic negotiable documents through compliance to MLETR
- Standards Development: Develop international standards that TradeTrust complies to
- Accreditation Structure: Certify technical solutions meet the requirements of the law
- Software Components: A set of open-source software code that can easily integrate backend solutions to the TradeTrust network

Design principles:

- Public and Permissionless: No central governance authority
- Data Off-Chain: Preserves data confidentiality
- Payload Agnostic: No data format or standard restriction
- Open-Source: Full transparency for faster adoption
- MLETR-Compliant: Meet the requirements of the law(for electronic negotiable documents)

Blockchain Applications in Trade

- **Blockchain vs traditional paper-based methods**
  - Pros
    - Reduces transaction time and costs
    - Prevents fraud more effectively
  - Cons
    - High implementation costs (technical and human capacity)
- **Blockchain vs centralized solutions**
  - Pros
    - No need to trust in a central administrator (for security, reliability, privacy, etc..); tamper-evident solution.
    - **Easier to get stakeholders across multiple industries and jurisdictions to agree in a solution**
  - Cons
    - Lower performance (at the moment)
    - Higher costs of implementation (at the moment)

Blockchain Applications in Trade: Implementation challenges

- **Common to blockchain & centralized solutions**
  - Digitalization of relevant process in firms and main actors of supply chain, particularly in SMEs (user side)
    - Low technological capacities and digital skills of the workforce
    - Legal frameworks for digital documents, signature, etc
- **Particular to blockchain**
  - Capacity to implement blockchain solutions (production side) – new tech -> fewer people with the required skills
  - Other depending on the implementation
    - Example: Banking regulations, cryptocurrency

Conclusions

Key messages

- Great potential to contribute to trade facilitation
  - Same challenges of centralized solutions
    - New challenges: novelty of applications, digital skills and capacities
  - **Past technological revolutions** offered windows of opportunity
- **Strengthen their innovation capacities** to strategically position to benefit from this new wave of technological change

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