NAKAMOTO &TURING LABS

Blockchain Technology: The Essentials & Applications

Chong Li

Who We Are

Nakamoto & Turing Labs (N&T Labs) is a NYC-based research lab

N&T is engaged in scientific and engineering research in the fields of blockchain and AI technologies

Ongoing Projects:
1. CanonChain: public blockchain for intelligent IoT
2. Pekka: “Airbnb” of Computing

Offices: New York, Hangzhou, Shenzhen, Singapore

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Outline

- Bitcoin & Blockchain
- Enterprise Blockchain
- Use Case
- Challenges and Opportunities

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Bitcoin & Blockchain

What is Bitcoin?

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- The most widely used cryptocurrency
- A completely digital, decentralized, engineered currency designed from using cryptography, computer science and economics
- Whitepaper: “Bitcoin: A Peer-to-Peer Electronic Cash System,” 2008
- Who is Satoshi Nakamoto?

What is Bitcoin?

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What is blockchain?

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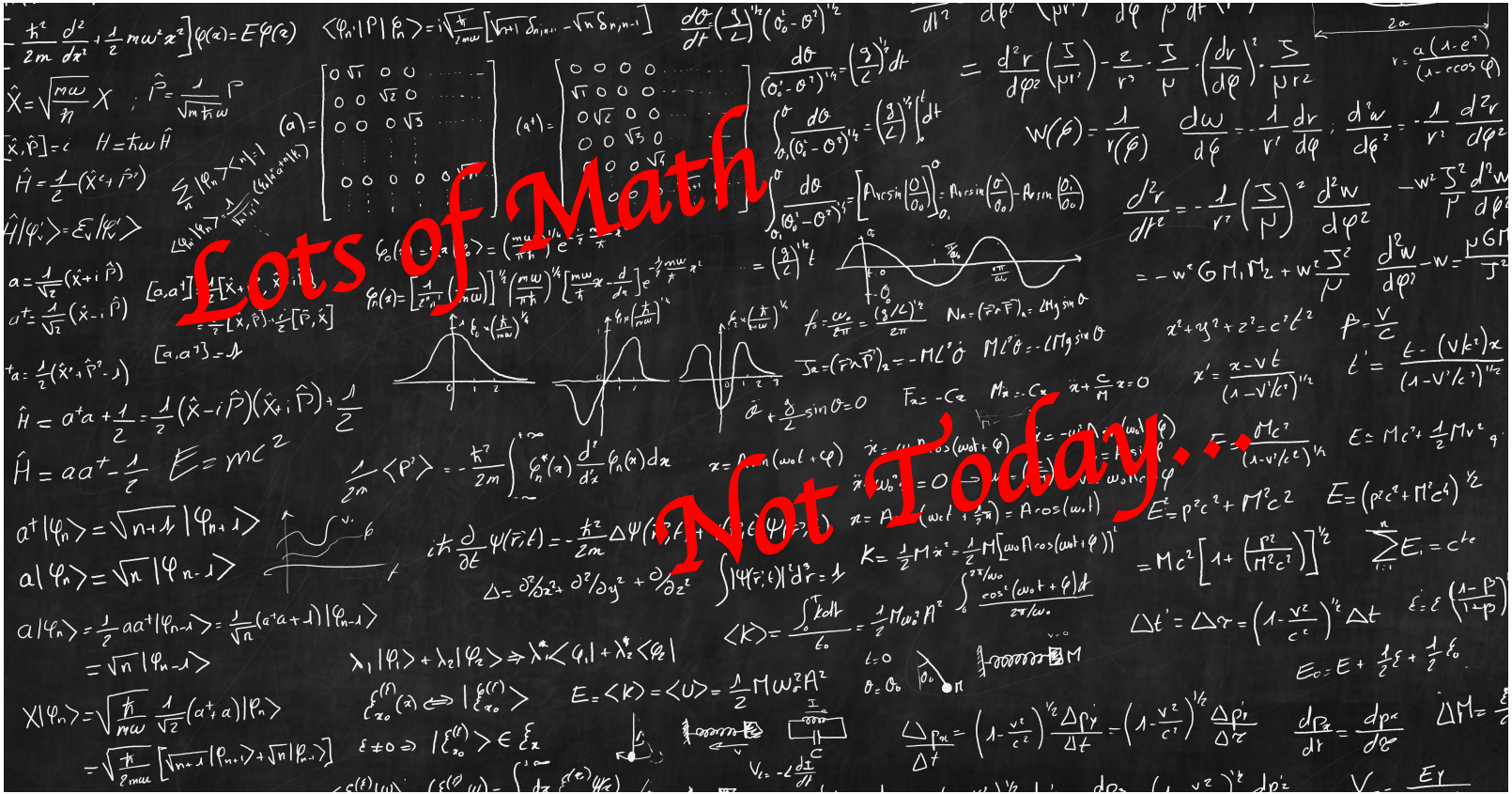

Why Blockchain?

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Two problems that a decentralized network typically face:

- Information Inconsistency for each node (due to the network communication latency)
- Difficulty to deal with malicious node attack (due to the random public access)

Centralized

decentralized

Why Blockchain?

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- Solution: blockchain technology

- Bitcoin, a cryptocurrency, is the *first* successful application of such a network

Bitcoin - User Identity

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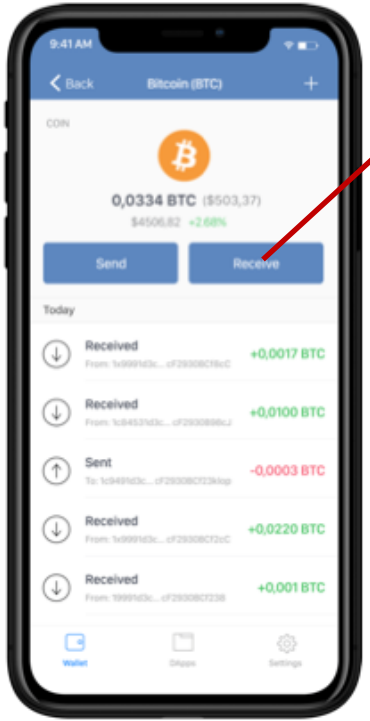
ID security: 2^160 possible addresses

- grains of sand on earth ~= 2^63

A wallet is an app or program that

- allows you send and receive Bitcoin
- keep track of your balance which is held in one or more bitcoin addresses
- keeps a history of your transactions



This Is Your Bitcoin Address
1BPaWv8f1GnxAP6VzbHjgjLfa8VSfpL4TF
Share this with anyone and they can send you payments.

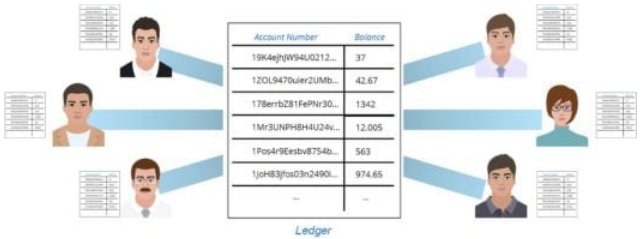
Bitcoin address

Bitcoin - Ledger

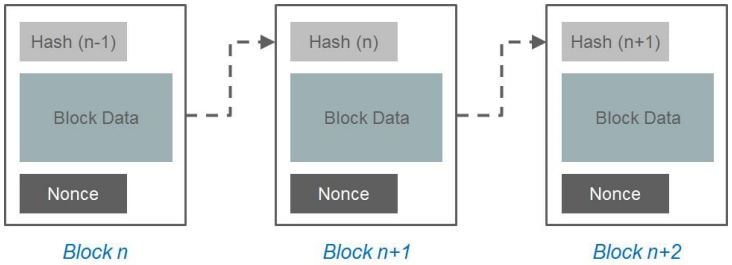
How do we store and track transactions?

Distributed database

- a chain of blocks, each block recording an ordered bunch of transactions
- each block references a previous block
- everyone stores the ledger



Everyone stores the ledger



Chain of blocks (source: edureka)

Bitcoin - Ledger

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How do we update the database?

Consensus

- miner creates a new block and broadcasts this block to the network
- ~ 10 minutes per block

Bitcoin - Consensus

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Who is the miner?

- The winner who first resolves a mathematical problem

What if Bitcoin was powered like Denmark?

Bitcoin as a decentralised value exchange mechanism has captured our imagination and interest in what crypto economies can bring. At the same time it has raised a number of concerns, especially around the staggering amount of resources that is needed to run this system. Actually, by some estimates Bitcoin is using as much energy resources as the whole country of Denmark, which is one of the most developed countries in the World.

Bitcoin Only Allows Transactions, Can We Do More ?

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- Ethereum is an open-source, public blockchain based distributed computing platform and operating system featuring smart contract functionality.

- A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract
  - e.g. vending machine

Smart Contract

Public and Permissioned Blockchain

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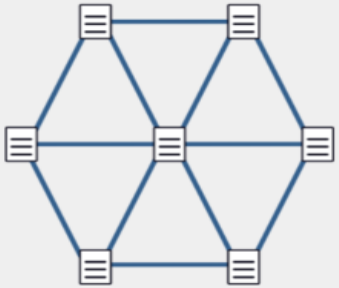
How Do Systems Compare?

Traditional Database

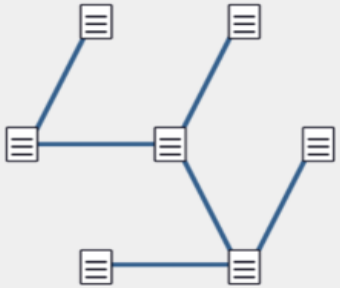
Centralized

Permissioned Blockchain



Distributed

Public Blockchain



Decentralized

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Enterprise Blockchain

Why Enterprise Blockchain?

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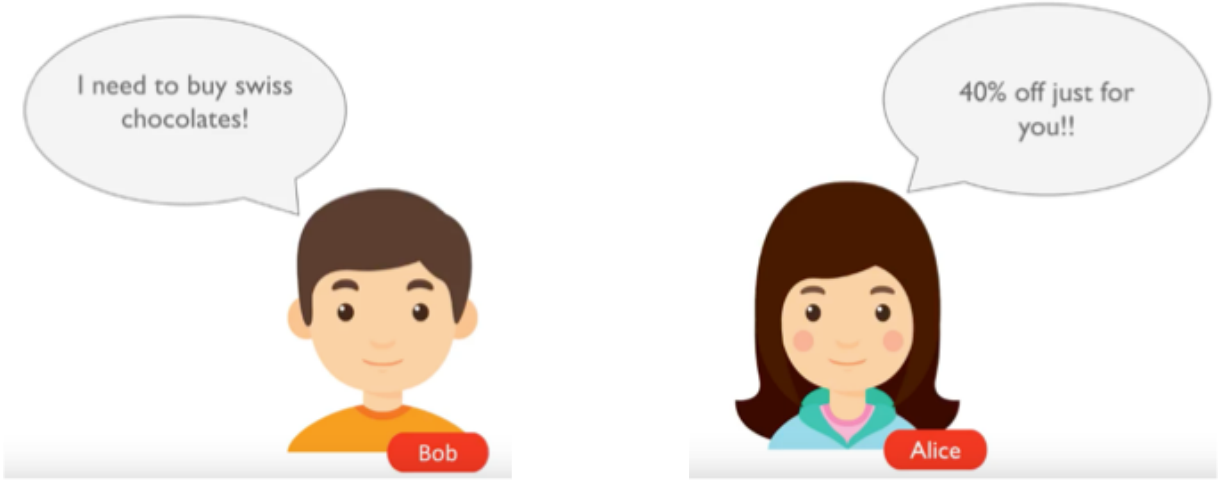
- Suppose Bob had a special deal with Alice to buy swiss chocolates



- However …

Example Source: edureka blog “What is Hyperledger – An Industrial Approach to Blockchain”

Why Enterprise Blockchain?

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- Alice wants to sell her products to a number of different markets at standard rates

Why Enterprise Blockchain?

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- A lot of third parties are required to complete the transaction, but they do not need to know about the special deal between Bob and Alice

Why Enterprise Blockchain?

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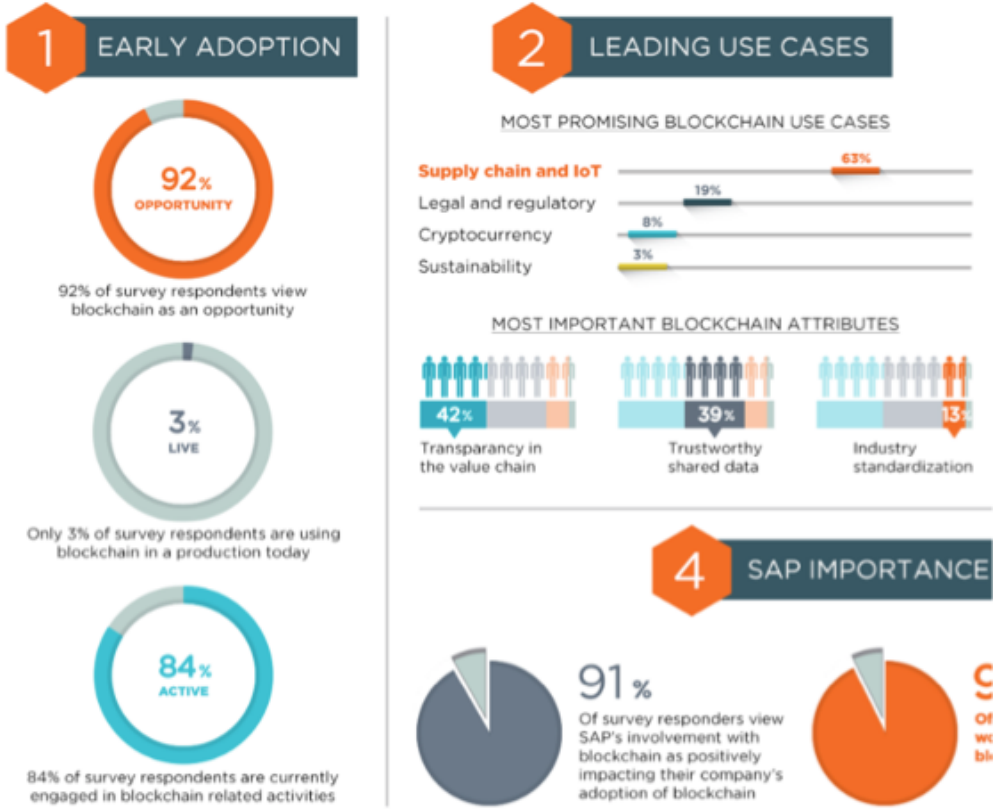
- on a public blockchain everyone knows the deal
- In our example, other markets and all third parties know the deal between Bob and Alice
- Confidentiality and Privacy is the key requirement for enterprise blockchain

Enterprise Blockchain Survey (April 2018)



Source: SAP article “Blockchain: A Study Rooted in Reality”

Enterprise Blockchain Survey (Oct. 2018)

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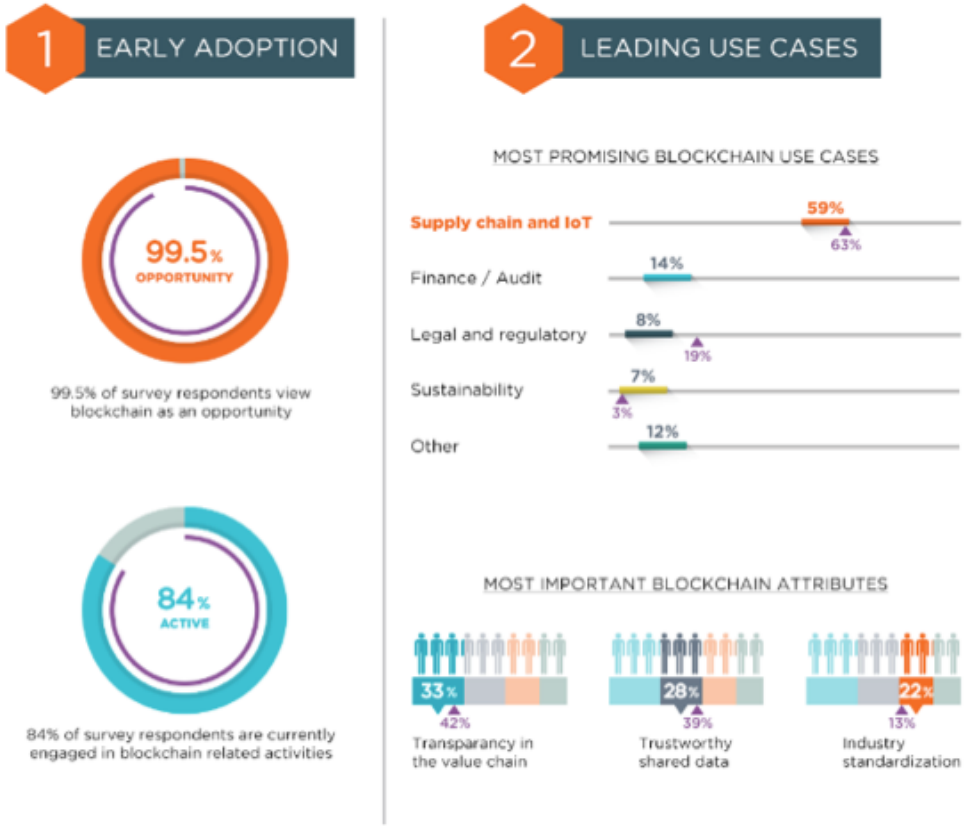

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Use Case

Supply Chain: From Ocean to Table

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Finance: JPM Coin

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Management: Smart Logistics

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Property Tokenization: U.S. STO Showcase

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Convexity Properties

20 million USD

St.Regis Aspen Resort

18 million USD

Factor-805 in Brooklyn, NYC

Non-disclosed

A luxury condo in Manhattan, NYC

30 million USD

Our Partnership

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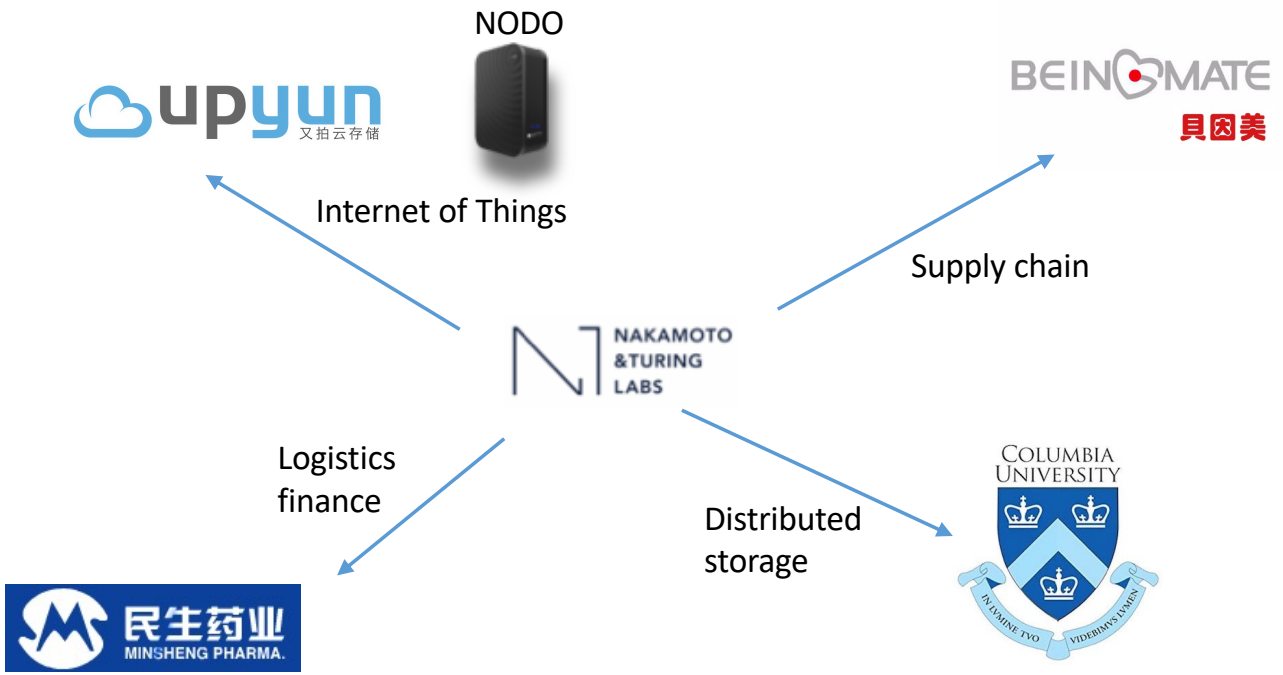

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Challenges and Opportunities

Scalability

Slow transaction speed

Transaction speed (tx per second)*

* Transaction speed: tps; source: https://howmuch.net/articles/crypto-transactions-speeds-compared

Privacy

blockchain is riskier than using a credit card in terms of privacy

- by analyzing the transaction graph, it is often possible to link users to transactions

using cryptography to provide enhanced privacy for its users

Storage

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- Nodes store the full history of the blockchain
- Limit lightweight nodes (e.g. IoT devices) from joining the network
- As time passes, history becomes larger, and the problem will be aggravated
- In December 2017, the size of the Bitcoin ledger is 149 gigabytes

Opportunities

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LET'S STAY IN TOUCH:

SLACK

DISCORD