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BLOCKCHAIN: PRINCIPLES OF WORK AND PERSPECTIVES OF APPLICATION

"*Online identity and reputation will be decentralized.*
We will own the data that belongs to us."
W. Mougayar, author The Business Blockchain:
Promise, Practice, and Application
of the Next Internet Technology (2016)

Blockchain is known as distributed ledger technology. It's like a distributed database, that millions of computers (often called nodes) around the world have access to and are constantly updating [2]. Distributed ledgers, the term of art for blockchain's underlying technology, offer an exciting new way to transact business without a central authority.

The first work on a cryptographically secured chain of blocks was described in 1991 by Stuart Haber and W. Scott Stornetta. The first blockchain was conceptualized by a person (or group of people) known as Satoshi Nakamoto in 2008 [2; 4]. It was implemented the following year by Nakamoto as a core component of the cryptocurrency bitcoin, where it serves as the public ledger for all transactions on the network. Through the use of a blockchain, bitcoin became the first digital currency to solve the double spending (a potential flaw in a digital cash scheme in which the same single digital token can be spent more than once) problem without requiring a trusted authority and has been the inspiration for many additional applications. The words *block* and *chain* were used separately in Satoshi Nakamoto's original paper, but were eventually popularized as a single word, *blockchain*, by 2016.

According to the fundamental principles of work in this technology any data put into the blockchain must be verified. Transactions are grouped together in blocks (hence the name blockchain), then verified by the computers (nodes) in the network. When a computer joins the network as a node, they receive a copy of the blockchain which acts as proof of all the transactions that have been performed.

This means that all data stored on the network is transparent; it is public by default. This also means that all the data in the blockchain network cannot be corrupted or deleted. However, this doesn't mean you can see who is doing the transaction. For instance, with bitcoin, the public can see that someone is sending an amount to someone else but there is no information linking the transaction to anyone. This is because the public keys linking the transaction are kept anonymous. As well, it is considered to be un-hackable because it doesn't have a centralized system. Instead, it is hosted by millions of nodes around the world, instead of being in one central place [2].

Blockchain is important due to the very open nature of it: any computer can be a part of the network, all data has to be verified, and also the fact that it is difficult to hack, companies and institutions see potential in using this technology. It's almost a second version of the internet. In a report about blockchain, the UK government said that

distributed ledger technologies, like blockchain have the potential to: “help governments to collect taxes, deliver benefits, issue passports, record land registries, assure the supply chain of goods and services and generally ensure the integrity of government records and services”

For this days we already have examples of how blockchain is changing our world. Here is a list of some companies and startups in various spheres of our life [1]:

Cybersecurity. “Guardtime” is a company that creates “keyless” signature systems using blockchain which is currently used to secure the health records of one million Estonian citizens. “REMME” is a decentralized authentication system which aims to replace logins and passwords with SSL certificates stored on a blockchain.

Healthcare. “Gem” startup is working with the Centre for Disease Control to put disease outbreak data onto a blockchain which it says will increase the effectiveness of disaster relief and response.

Financial services. Bank Hapoalim is a cooperation project between the Israeli bank and Microsoft to create a blockchain system for managing bank guarantees, which is a revolution in the management of money and assets over the Internet, and is expected to play a central role in the smart economy of the coming decades [3].

Government. Dubai has set sights on becoming the world's first blockchain-powered state. In 2016 representatives of 30 government departments formed a committee dedicated to investigating opportunities across health records, shipping, business registration and preventing the spread of conflict diamonds. The same is happening in Estonia where the country’s government has partnered with “Ericsson” on an initiative involving creating a new data center to move public records onto the blockchain.

To sum it up, the technology of blockchain is here to change our world again making decentralized networks the next huge wave in technology. It has already started integration in various sectors of our life. A lot of countries are considering how they can use it for improvement of human life, and I this is only the beginning.

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