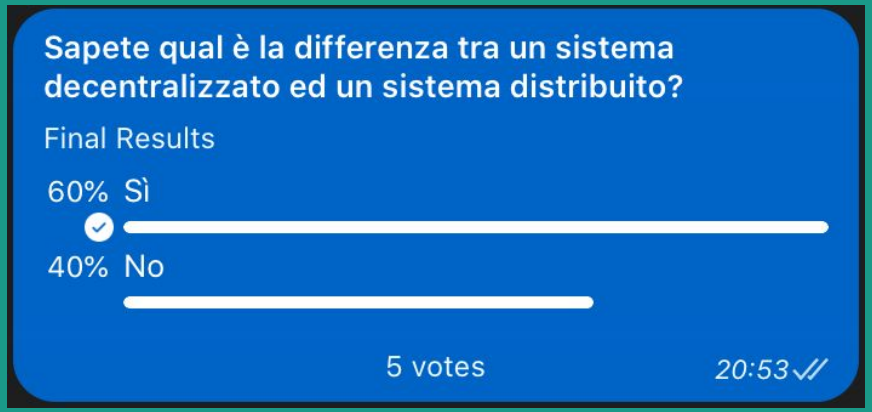
Do you trust it? No, I don't.

Part I

Your votes matter!

Poll about the difference between **distributed** systems and **decentralized** systems



https://t.me/c/1351105384/1417

It all began in January

With blockchain, but I don’t remember why!

I was fascinated by the blockchain technology rather than cryptocurrencies.

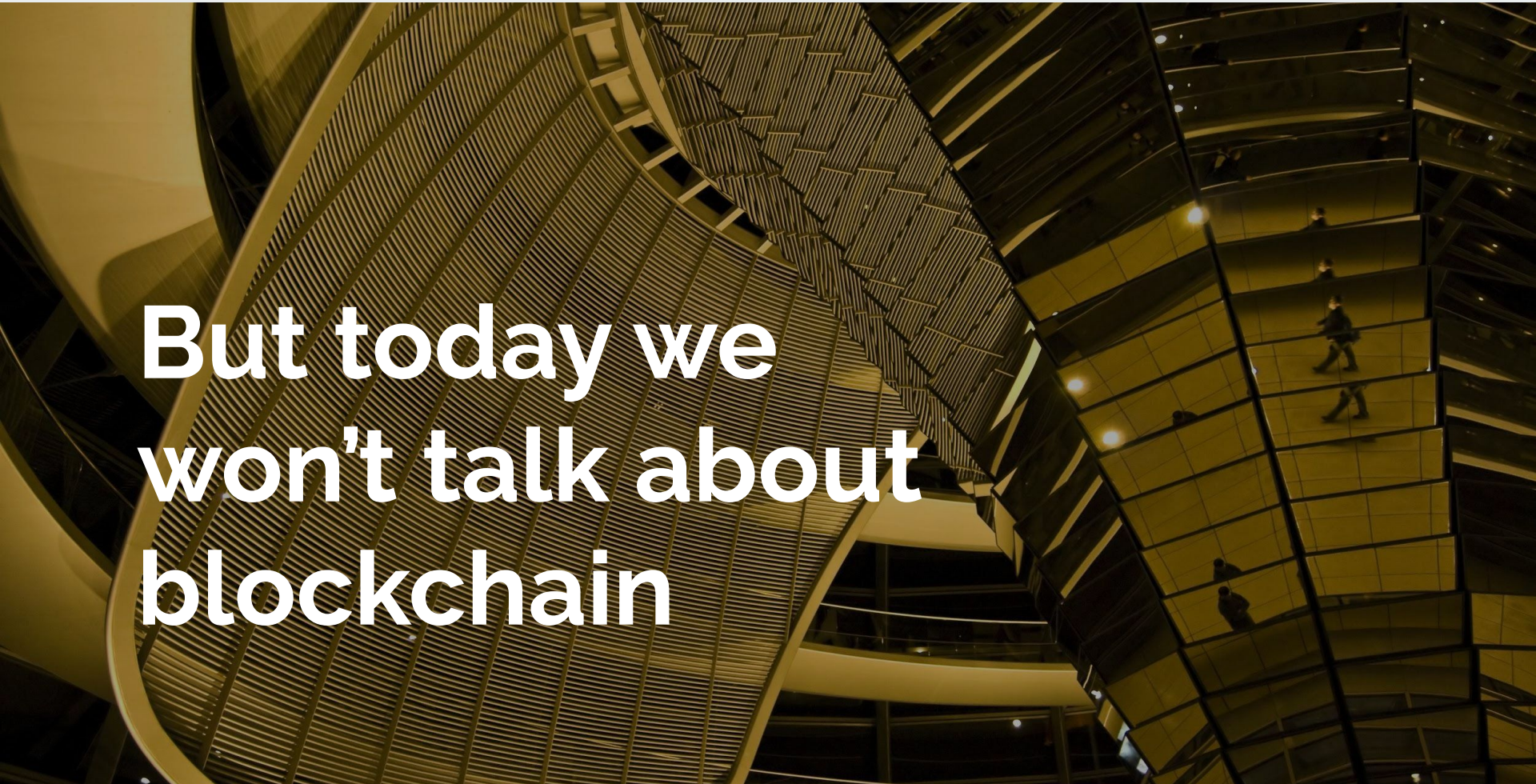
After reading the Bitcoin white paper, the only thing I wanted was to delve into this topic.

Also AI is interesting

But the blockchain technology is made up of already existing technologies.

AI requires you to learn new algorithms that will be the building blocks of all AI theory.

Blockchain not. It uses a set of common concepts and technologies.


But today we won't talk about blockchain

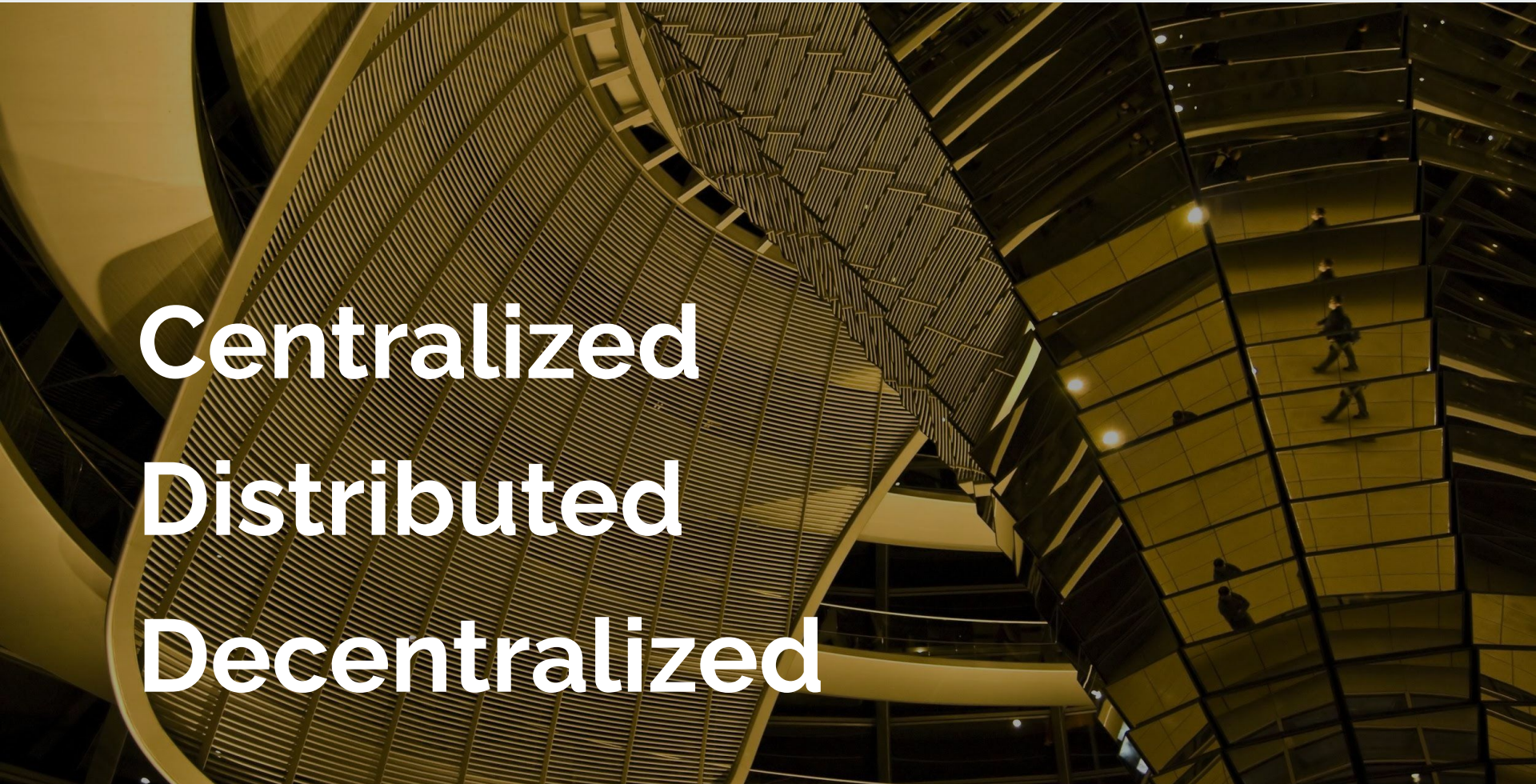
We talk about a general concept on which the blockchain is based

Decentralization

Tip

I recommend you to read the Vitalik Buterin's article. He explains today's topics better and more thoroughly.

Vitalik is the founder of Ethereum.


Centralized
Distributed
Decentralized

Classification (famous pics on the networks)

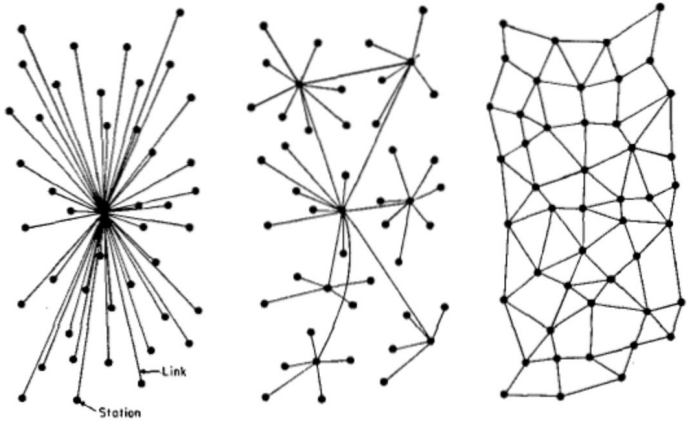


Fig. 1—(a) Centralized. (b) Decentralized. (c) Distributed networks.

Source from which I took the screenshot

Original paper

Classification - Centralized

1

Non-distributed

MS Word on your Windows PC.

MS controls the OS and the app. OS and app are located on your PC.

2

Distributed

Cloud service provider offering a data storage service.

Data are replicated on different machines according to resource availability and resiliency. The cloud service provider controls all these machines.

Source: Medium

Classification - Decentralized

1

Non-distributed

Linux on your PC.

The Linux source code is open-source and the software is made by several developers around the world.

2

Distributed

Bitcoin.

It is a blockchain system that cannot be altered by anyone. It works on several p2p nodes (spread across the globe) which are all on the same level.

Source: Medium

Types of decentralization

- Architectural (de)centralization
- Political (de)centralization
- Logical (de)centralization

Architectural (de)centralization

How many **physical computers** is a system is made up of?

Political (de)centralization

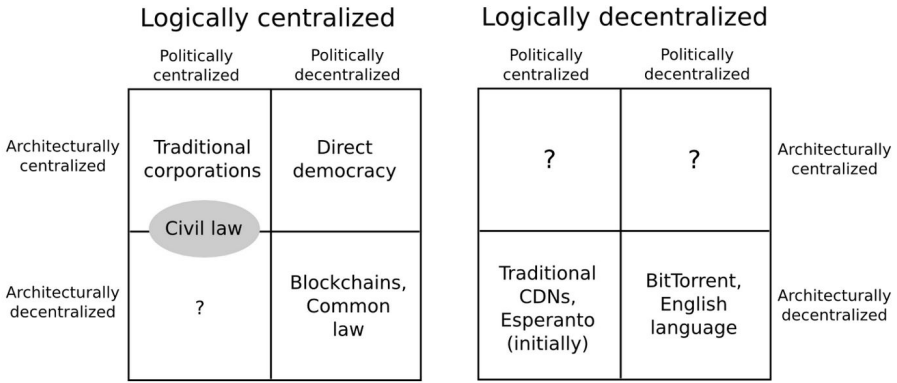
How many **individuals or organizations** control the computers that the system is made up of?

Logical (de)centralization

Does the **interface and data structures** that the system presents and maintains look more like a single monolithic object, or an amorphous swarm?

One simple heuristic is: if you cut the system in half, including both providers and users, will both halves continue to fully operate as independent units?

Starting from the previous classification, we can get this



Source: Buterin's article


Three reason for
decentralization

Fault tolerance

Decentralized systems are **less likely to fail accidentally** because they rely on many separate components that are not likely.

Attack resistance

Decentralized systems are **more expensive to attack and destroy or manipulate** because they lack sensitive central points that can be attacked at much lower cost than the economic size of the surrounding system.

Collusion resistance

It is much harder for participants in decentralized systems **to collude to act in ways that benefit them at the expense of other participants**, whereas the leaderships of corporations and governments collude in ways that benefit themselves but harm less well-coordinated citizens, customers, employees and the general public all the time.

Examples

Immuni

- The app sends requests to find out if anyone is nearby.
- If a person has been near an another person more than ~15 minutes, the app logs this event.
- If there is a infected person, from the app, a healthcare provider sends the user ID to the government servers. These servers provide an up-to-date list of infected people.
- The app periodically checks the list. If there is an ID saved in the phone from the app in the list, the app notifies the user of a contact with an infected person.
- The up-to-date list saves only the IDs of the people.
- The app doesn’t save any personal information. The app periodically changes the ID.
- France has adopted a centralized infrastructure.

League of Legends - Part I

- In this game, there is no way to use ***hacks***. Why?
- Suppose you are playing with other four friends. You can play through the servers provided by the software house.
- One of your friends wants to use a hack to gain an advantage at the expense of others.
- What happen?
- All the players of a match compute and validate the steps of others (i.e. A checks that the move of B is legit, B checks …)
- In this way if anyone wants to use the hacks, they will be immediately discovered by the other players.

League of Legends - Part II

- Using this method, LoL can get mainly two edges:
  - Users are forces to play fair (no hacks are admitted)
  - This huge amount of computing is delegated to the users pcs. All this computing doesn't overload the servers.

Blockchain

We will talk about it in the next speech 🙂

So, don’t just distribute knowledge,
but decentralize it to the world.
It’s safer.

Bibliography

- Vitalik Buterin, *The Meaning of Decentralization*, Medium, 2020.
- Julia Poenitzsch, *What's the difference between Decentralized and Distributed?*, Medium, 2020.
- Paul Baran, *On distributed communications networks*, 2020. The paper was written in September 1962.

To be continued...