Demonstrator to Visualize and Manage an Ethereum Blockchain

(Bibliography report)

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***Abstract*—This research focuses on the implementation of a web interface allowing to control and visualize an Ethereum blockchain. The demonstrator will then be used to create a blockchain containing a catalogue of space debris.**

I. Context

The principle of blockchains consists in implementing a kind of database managed in a totally decentralized way. The information is stored in blocks, which are linked using cryptography (each block stores a cryptographic hash of the previous block). It is managed by a peer-to-peer network, without any trusted authority. No centralized official copy of the blockchain exists and no user is trusted more than any other.

By design, a blockchain is resistant to modification of the data. Because each block contains the hash of the previous block, in order to modify a given block, one would have to change all the following blocks, which would require consensus of the network majority.

To create a new block, each member (called node) of the network tries to accomplish a proof of work. The first computer to achieve it can publish its current block and all the other nodes accept it. The difficulty of the problem is adapted, so that the time between the generation of two blocks is almost constant. On Ethereum, it is between 14 and 15 seconds, while on Bitcoin it is about 10 minutes.

However, this proof of work concept implies that the computers work all day long, and use a lot of electric energy. The 31—45 TWh of electricity used for bitcoin in 2018 produced 17—22.9 MtCO2 [10]. Other concepts exist, in order to reduce this environmental impact.

Moreover, each node contains a copy of the blockchain, which can be very heavy (from January 2016 to January 2017, the bitcoin blockchain grew from 50 GB to 100 GB in size) [2]. Growth of a decentralized blockchain is accompanied by the risk of centralization because the computer resources required to process larger amounts of data become more expensive.

The first blockchain was conceptualized by a person using the name Satoshi Nakamoto (his real identity is unknown) in 2008 [11]. In 2009, he used it to develop the bitcoin blockchain.

Today, it is mainly used by cryptocurrencies. The most famous blockchain is the bitcoin blockchain, but it is not the only one: other cryptocurrencies include Ethereum, Litecoin, Ripple, Monero, Dash... However, public or private blockchains can be used for business or personal use. For example, a blockchain game, CryptoKitties [4], was launched in November 2017, encountering a big success.

Another example: in some countries, there is no complete or secure real estate title registration, such as in Ghana or Honduras [3]. The governments are interested in using a blockchain to avoid fraud.

Ethereum [5] is the blockchain that was used in this project. Its particularity is that it features the smart contract functionality: in short, it allows programs to run on the blockchain [12].

II. Problem statement

How can a user interact with a blockchain, see how many nodes are connected, examine what are in the blocks, know the number of blocks mined? Usually, interacting with a blockchain is made through the terminal of the computer, using commands. However, it is not a user-friendly method, because the commands can be hard to understand, and the task can be repetitive. So it can be relevant to have an interface, asking only the key information to the user and managing the interaction with the blockchain.

III. State of the art

The interaction with blockchain is done using a wallet, for example MyEtherWallet, MetaMask or MyCrypto [6]. The wallet allows to send transactions to the blockchain, and buy some ether using real money. But a user has to register before using these services.

Without any inscription required, the user can still see information about the main Ethereum blockchain. Some websites get the information from the blockchain and display it for free.

https://www.etherchain.org/ [1] allows everyone to see the key information about the Ethereum Blockchain, such as the latest blocks and transactions, or the time between two blocks. https://etherscan.io/ [7] offers the same kind of service, with a different look.

However, these two services only work for the public Ethereum blockchain.

In order to manage a private blockchain, most users create a small server, using NodeJs for example, without bothering writing a CSS stylesheet.

Our goal is to create a user-friendly interface to interact with a private blockchain.

IV. First developments and future work

In order to create a private Ethereum blockchain, we used Hyperledger Besu [9], which is an open source Ethereum client written in Java.

Using Expressjs, we have a working server that retrieves information from the private blockchain, and allows the user to send a transaction.

We are focusing on using Golden Layout [8] to have a great interface.

Currently, the major issue is combining expressjs and Golden Layout.

The ultimate goal is to use this interface to store a catalogue of space debris.

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