American Journal of Electronics & Communication
Trijit Roy Chowdhury et. al., American Journal of Electronics & Communication, Vol. III (3), 11-15

Crypto Pay: Design of Public Blockchain Platform

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***Abstract*—Blockchain is a decentralized distributed platform that allows multiple peers to exchange digital assets securely all over the globe without third party. In blockchain, blocks are connected by using hash that maintains the order of transaction. In this paper, a crypto currency transfer in Web 3.0 platform is built based on Ethereum Blockchain to implement decentralized application. This paper is also focused on the latest cutting-edge technology to transfer funds easily and very efficiently and quickly. The working model can solve issues regarding many spheres of the multiverse and can be connected to transfer real cryptocurrency anywhere across the globe. The main uniqueness of the model that it offers to its users with full trustiness and curb the wrong uses of third parties to control any transactions of Web 2.0, especially tracking or hacking sites or data servers and block any transactions and transact money into a wrong account. Here, the transaction is verified, decentralized, and secured where no third party is involved in the process actively and no personal logged data is required. Each transaction can be seen and matched by the address stored on the transaction site of Ethereum. This research paper concludes with the implemented methodology for creation, deployment on Ethereum, blockchain, and interaction of smart contract using ReactJS, EthersJS, alchemy API and hardhat. Just people need to understand the appropriate usage of Cryptocurrency transactions using virtual wallets.**

Keywords*—Blockchain, Cryptocurrency Wallet, Ethereum, Bitcoin, Easy Wireless Transactions, High Security, Trust & Value.

I. Introduction

Web 3.0, or decentralized web, hits the cryptocurrency markets and blockchain communities since the beginning. A blockchain is a decentralized and distributed database system which comprises of various records bundled to form a block [1]. The blockchain is not controlled by single entity but it is controlled or managed by the group of people who are using that blockchain [2]. If a person wants to transfer money to another person, then there is a need to trust a third party like banks or financial institutions. Here is the drawback with a centralized application [3]. To solve these problems, a completely decentralized 'Crypto Pay' application is built. With the use of 'Crypto Pay', a person can directly transfer money to another person without the need of a third party. On the other hand, the blockchain being a distributed system no person has an authority over another person. A blockchain is hosted by a group of people on the network from all over the world [4]. Ethereum which is the next step in the future or blockchain technology, is applied in our working model. It is built from the same foundation technologies as the bitcoin block-chain; however, it takes the possibilities or blockchain technology to another level. By utilizing the Ethereum network, our working model is quickly created with ease without the need to create one's own blockchain and cryptocurrency. Ethereum network uses the cryptocurrency 'Ether' which acts as currency on the network [5] [6]. Ether is exchanged a payment for running decentralized apps on the network [7]. One of the problems with the Bitcoin network is that it is more powerful than the top supercomputers in the world combined and yet that processing power is wasted generating random numbers to acid blocks to the blockchain [8]. Ethereum puts all the computers connected to the network and their processing power to better use allowing developers to create applications that run using the combined processing power of the network along with blockchain technology [9]. The Ethereum platform also has the Ethereum Virtual Machine and Solidity programming language. Solidity is used to create our decentralized application, 'Crypto Pay' that is then compiled by the Ethereum Virtual Machine and run on the blockchain. Our paper explains how the transaction of Ethereum works and a wallet is used to operate Ethereum transaction using Blockchain technology and forming a new way in this new era of online banking and transaction system. This uses a wallet which is highly secured and trustworthy. There are multiple Blockchains, but we have tried our work with the ETH and hence making it a successful one, well there are other projects which highlight bitcoin as the main cryptocurrency, but we had tried something new.

II. Literature Review

Basically, our researchers have done some survey of the current cryptocurrencies to understand the different blockchain & its types. This manipulates and evaluates strengths, weaknesses, and possible threats to all strategies be it major or minor. This actually shows how cryptocurrencies are mined, where they have their own identity of detecting threats and security issues. Basically a blockchain works under a peer to peer network where all data is secured [10]. Ethereum is a platform on top of a blockchain with a programming language that allows developers to create and run decentralized applications and smart contracts on the powerful, distributed computing platform and blockchain underlying the Ethereum platform [10] [11] [12]. Decentralized apps (dApp) [13] have no single ever or entity controlling them; dApps run across a network of computers. Smart contracts [14] automatically verify, execute and enforce the contract based on the terms written in the code without the need for third-party intermediaries such as lawyer or courts to enforce the contracts. Anything of value can be exchanged using smart contracts; they do not only refer to legal contracts. Smart contracts reduce risks associated with transacting on the

blockchain network, as transactions and payments are handled automatically by the network. The Ethereum platform is the next step in the future of blockchain technology that includes smart contracts and decentralized apps-this technology is often referred to as Blockchain 2.0 [15]. Smart contracts are contracts that are written in computer code and operate on a blockchain or distributed ledger. They automatically verify, execute, and enforce the contract based on the terms written in the code. If the conditions of a contract are met, payments or value are exchanged based on the terms of the contract. Likewise, if condition in the contract are not met, payments may be withheld if written into the smart contract. Entries on the blockchain are timestamped and can't be altered. This creates an ideal platform for contracts as any changes to contracts are timestamped, while the previous versions are retained on the blockchain.

III. Prposed Work

'Crypto Pay' is a decentralized crypto transfer application, using this application user can transfer their Ethereum entire world without any need to trust a third party like banks or financial institutions. They are basically a way to transact, trade without having a centralized control. They emerged at the forefront when the centralized exchanges could not address some of the real challenges. There emerged a lot of issues regarding normal Web 2.0 online or even offline (normal) money transactions. Here the benefit is only the payer and payee gets to know about the address stored into the software's database which only both of them will have a record. This is the most secured way since there is no chance any kind of transaction issue or any other kind of cyber frauds which the cyber security domain of the technology cannot handle, the latest Web 3.0 based 'Crypto Pay' can solve and give instant way to transfer actual crypt currency through his own wallet. If it's a successful across the globe it will be one of the most important innovations of amount transfer only if it gets the proper trust and proper knowledge of the latest cutting edge technology which 'Crypto Pay' uses using Web 3.0 where no user's personal data is required while transacting actual cryptocurrency. Anyone and everyone can access it and have a crypto wallet of his/her own. The World will be a much better place if the project gets properly introduced and Implemented to the World and give a vast Solution to lots of problems. Just Because the World runs on trust and value (currencies) which is printed by various countries. This is just a new concept and the best way to solve all the money related issues of the world. Just a Proper Knowledge and Trust within the people, and the new online World emerging as Web 3.0 will be a place of more happiness, trust and love.

IV. Frontend Technology

We have used the following to enhance our front end part of our work:

A. *React JS*

We used React JS to build our application. React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. React can be used as a base in the development of single-page, mobile, or server-rendered applications.

B. *Tailwind CSS*

Tailwind CSS works by scanning all of your HTML files, JavaScript components, and any other templates for class names, generating the corresponding styles and then writing them to a static CSS file. It's fast, flexible, and reliable — with zero-runtime.

```
<div className='flex flex-1 justify-evenly items-center flex-wrap sm:mt-0 mt-5 w-full'>
    <p className='text-white text-base text-center mx-2 cursor-pointer'>Market</p>
    <p className='text-white text-base text-center mx-2 cursor-pointer'>Exchange</p>
    <p className='text-white text-base text-center mx-2 cursor-pointer'>Tutorials</p>
    <p className='text-white text-base text-center mx-2 cursor-pointer'>Wallets</p>
</div>
```

Fig. 1. Tailwind CSS Class Base Coding Structure.

C. *GIPHY API*

GIPHY API Generated gif according to transaction keyword.

Fig. 2. Gif Generated Process According to Given Keyword.

V. Blockchain Technology

A. Ethereum

Ethereum is a decentralized, open-source blockchain with smart contract functionality. Ether or ETH is the native cryptocurrency of the platform. Among cryptocurrencies, Ether is second only to Bitcoin in market capitalization. Ethereum allows anyone to deploy permanent and immutable decentralized applications onto it, with which users can interact.

B. Solidity and Smart Contract

Solidity is an object-oriented programming language for implementing smart contracts on various blockchain platforms, most notably, Ethereum. Solidity is a statically-typed object-oriented programming language designed for developing smart contracts that run on Ethereum.

A Smart Contract (or crypto contract) is a computer program that directly and automatically controls the transfer of digital assets between the parties under certain conditions. A smart contract works in the same way as a traditional contract while also automatically enforcing the contract. Smart contracts are programs that execute exactly as they are set up(coded, programmed) by their creators. Just like a traditional contract is enforceable by law, smart contracts are enforceable by code.

C. Coin Ranking API

An application programming interface (API) is a way for two or more computer programs to communicate with each other. Use Coin ranking API to integrate cryptocurrency prices into website. Gain access to high-quality data about all coins, like price history, circulating supplies, exchanges, trading pairs, and much more.

Fig. 3. Crypto Currency Details.

VI. Deploy Smart Coontract of Ropsten Testnet

The main steps to deploy the smart contact are listed step by step:

A. Step 1: First we have to connect to the ethereum network

There are many ways to make requests to the Ethereum chain. For simplicity, we'll use a free account on Alchemy, a blockchain developer platform and API that allows us to communicate with the Ethereum chain without having to run our own nodes.

B. Step 2: We have to create our app (and API key)

Once you've created an Alchemy account, you can generate an API key by creating an app. This will allow us to make requests to the Ropsten test network.

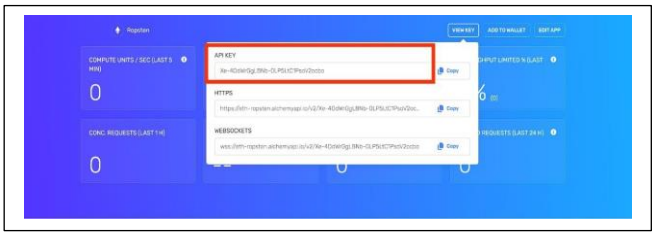

Fig. 4. Alchemy API Key.

C. Step 3: We need to create an thereum account (only the address)

We need an Ethereum account to send and receive transactions. For this project, we'll use Meta Mask, a virtual wallet in the browser used to manage Ethereum account address.

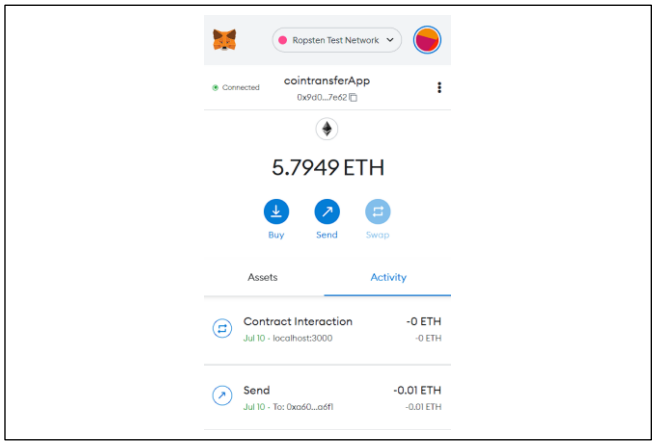

Fig. 5. Meta Mask Wallet.

D. Step 4: We need to add ether from a faucet

In order to deploy our smart contract to the test network, we'll need some fake ETH. To get ETH you can go to the Ropsten faucet and enter your Ropsten account address, then click "Send Ropsten ETH." It may take some time to receive your fake ETH due to network traffic. You should see ETH in your Meta Mask account soon after.

E. Step 5: We have to download hardhat

Hardhat is a development environment to compile, deploy, test, and debug your Ethereum software. It helps developers when building smart contracts and dapps locally before deploying to the live chain.

F. Step 6: Then we write our contract

Open up project in VS Code editor, Smart contracts are written in a language called Solidity which is what we will use to write our Transaction.sol smart contract.

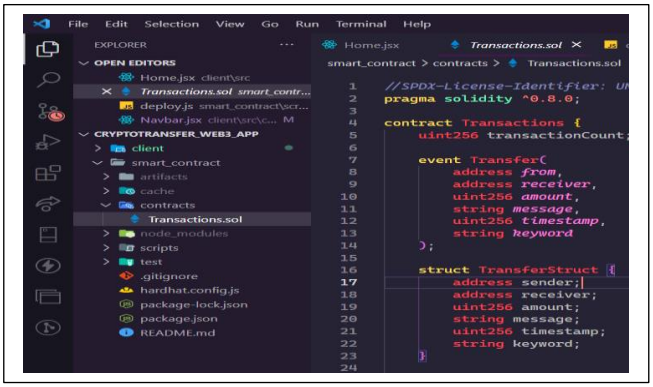

Fig. 6. Transaction File Creation and Write Smart Contract.

G. Step 7: Then we need to connect to the meta mask and alchemy to our project

We've created a Meta Mask wallet, Alchemy account, and written our smart contract, now it's time to connect the three. To provide our program with this permission, we can add our private key (and Alchemy API key) in our project.

```
module.exports = {
  solidity: '0.8.0',
  networks: {
    ropsten: {
      url: 'https://eth-ropsten.alchemyapi.io/v2/Xe-4OdWrGgLBNb-0LP5LtC1PsoV2ocbo',
      accounts: ['a4048ca1d9b55081ec8c4a24e2b4588f3a46c9a5414d09ab3883615c6fb8db88']
    }
  }
};
```

Fig. 7. Connect Smart Contract with Alchemy.

See below to get HTTP Alchemy API URL.

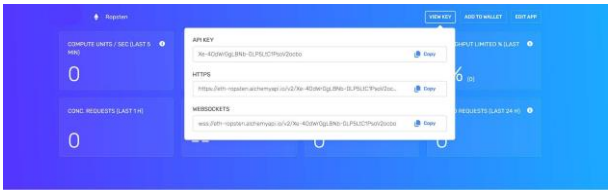

Fig. 8. Alchemy Websocket HTTPS Request.

H. Step 8: After that we have to install ether.js

Ethers.js is a library that makes it easier to interact and make requests to Ethereum by wrapping standard JSON-RPC methods with more user-friendly methods.

Hardhat makes it super easy to integrate Plugins for additional tooling and extended functionality. We'll be taking advantage of the Ethers plugin for contract deployment (Ethers.js has some super clean contract deployment methods).

I. Step 9: We have to compile our contract

To make sure everything is working so far, let's compile our contract. The compile task is one of the built-in hardhat tasks. From the command line run: **npx hardhat compile**

J. Step 10: Then we have to write our deploy script

Now that our contract is written and our configuration file is good to go, it's time to write our contract deploy script.Navigate to the scripts/ folder and create a new file called deploy.js , and write our deploy script:

```
const main = async () => {
  const Transactions = await hre.ethers.getContractFactory("Transactions");
  const transactions = await Transactions.deploy();
  await transactions.deployed();
  console.log("Greeter deployed to:", transactions.address);
}

const runMain = async () => {
  try {
    await main();
    process.exit(0);
  } catch (error) {
    console.error(error);
    process.exit(1);
  }
}
runMain();
```

Fig. 9. Smart Contract Deployment Script.

K. Step 11: Deploy our contract

We're finally ready to deploy our smart contract! Navigate to the command line and run: **npx hardhat run scripts/deploy.js --network ropsten**

Now we can easily interact with the Ethereum blockchain and our smart contract is successfully deployed in the Ethereum chain.

VII. Crypto Transfer Process

First, you need to connect your Ethereum wallet to this application just click connect wallet button to connect your wallet.

Fig. 10. Wallet Connection Process.

After the connection is successful, you can see your wallet address in the Ethereum card box.

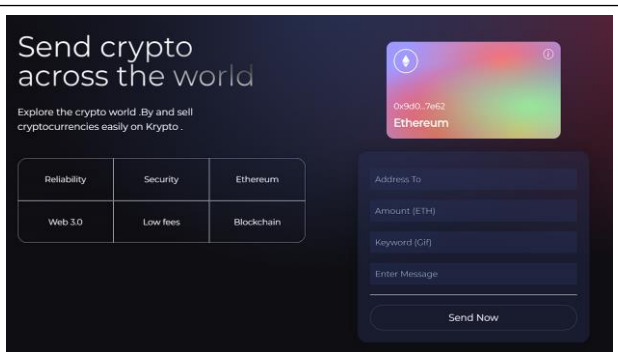

Fig. 11. Wallet Connect Confirmation and Crypto Sending Process.

Sending crypto just put the address (which account you want to send) then give the amount, gif keyword (what type of gif you want), type your message then click send button.

After the transaction will be successful you can see the transaction history with gif, and transaction message also.

You can see the current crypto price also.

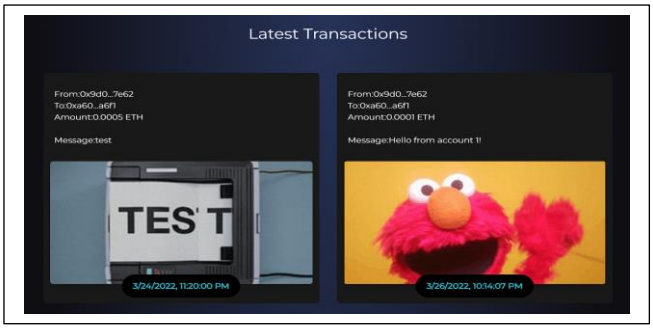

Fig. 12. Transaction History.

Fig. 13. Crypto Currency Latest Update.

VIII. Proposed Solution

'Crypto Pay' is a decentralized crypto transfer application, using this application user can transfer their Ethereum entire world without any need to trust a third party like banks or financial institutions. They are basically a way to transact, trade without having a centralized control. They emerged at the forefront when the centralized exchanges could not address some of the real challenges. There emerged a lot of issues regarding normal Web 2.0 online or even offline (normal) money transactions. Here the benefit is only the payer and payee gets to know about the address stored into the software's database which only both of them will have a record. This is the most secured way since there is no chance any kind of transaction issue or any other kind of cyber frauds which the cyber security domain of the technology cannot handle, the latest Web 3.0 based 'Crypto Pay' can solve and give instant way to transfer actual crypt currency through his own wallet. If it's a successful across the globe it will be one of the most important innovations of amount transfer only if it gets the proper trust and proper knowledge of the latest cutting-edge technology which 'Crypto Pay' uses using Web 3.0 where no user's personal data is required while transacting actual cryptocurrency. Anyone and everyone can access it and have a crypto wallet of his/her own. The World will be a much better place if the project gets properly introduced and Implemented to the World and give a vast Solution to lots of problems. Just Because the World runs on trust and value (currencies) which is printed by various countries. This is just a new concept and the best way to solve all the money related issues of the world. Just a Proper Knowledge and Trust within the people, and the new online World emerging as Web 3.0 will be a place of more happiness, trust and love.

IX. Conclusion and Future Scope

The main goal of our research work is to develop an approach for addressing the fundamentals of the visionary blockchain technology which is today's cutting edge technology and all have to accept it however. This is pertinent in revolutionizing current centralized economy to a decentralized one. We also have tried to propose a novel approach of deploying a smart contract and interacting with it. In this paper, we have tried our best to innovate ourselves to explore some of the unexplored ideas which are related to Ethereum, smart contracts, Hardhat and Alchemy.

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