

Decentralized storage solutions on the Blockchain

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D17B 38

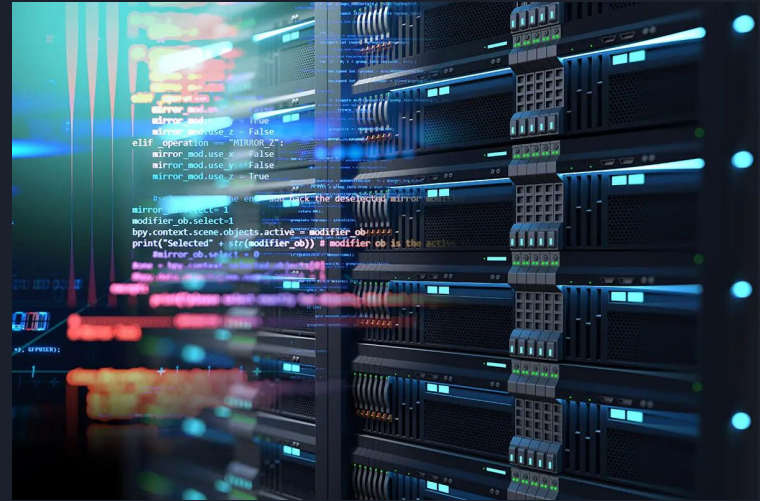
Introduction to Data Storage

Data Storage Server System:

A storage server is used for storing a large amount of data files

It is used to transfer large files over a network.

When organization expands, the need for data storage increases.





Different Types of Data Storage Devices

SSD &
Flash
Storage

Hybrid
Storage

Hard
Disk
Drives

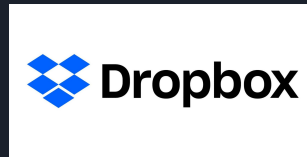
Cloud
Storage



Centralized Storage System

When data is stored at a single location and shared among users with the help of servers. It is also known as networked storage.

Example:

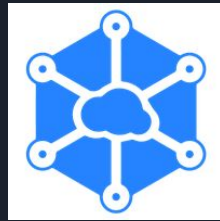




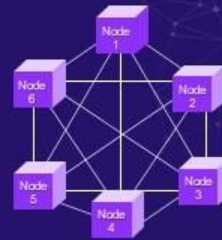
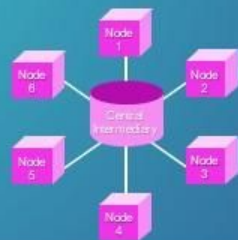
Decentralized Storage System

Decentralized Cloud storage is a system where data is stored on multiple servers. It is a peer-to-peer decentralized cloud storage solution.

Example:



Centralized vs Decentralized Data Storage System



Comparison Characteristics

Centralized

- ▶ Data must flow through a central point (server)
- ▶ Data communication flow is vertical
- ▶ The responsibility lies with the central point, which can be one server
- ▶ Mass adoption
- ▶ Systematic reservation of authority in a network

Data Flow

Data Communication Flow

Decision Making

Adoption

Authority

Decentralized

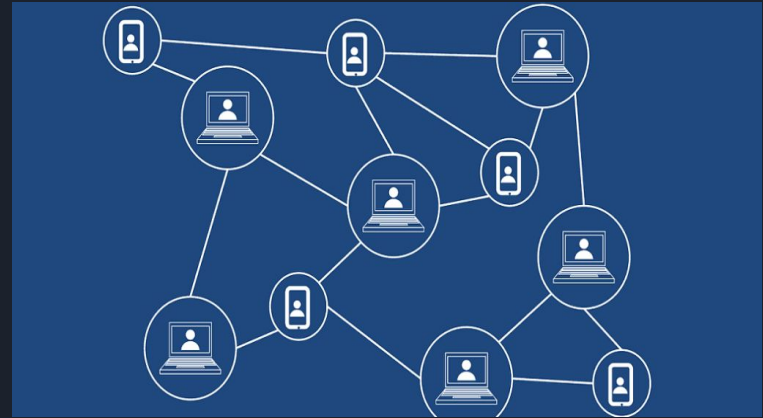
- ▶ Data flows through points without any single specific point
- ▶ Data flow is always open and free
- ▶ Difference in bullet indent; please check
- ▶ In the early phases of adoption
- ▶ Systematic distribution of authority among access points

Blockchain based Decentralized Data Storage

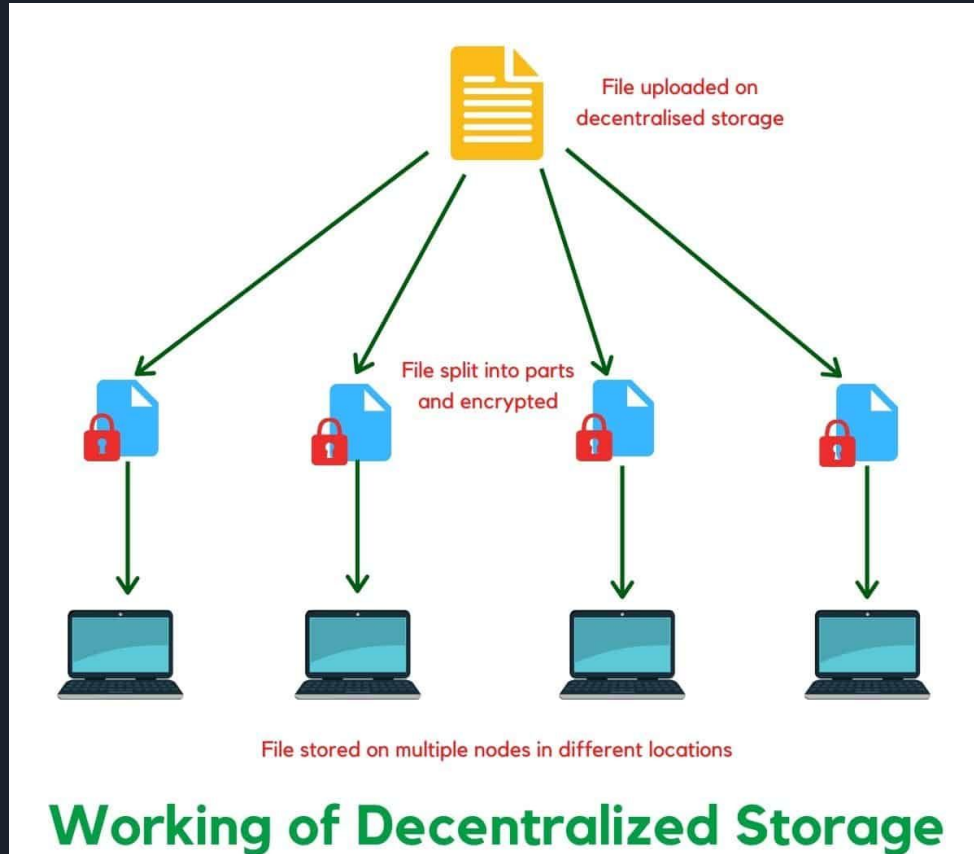
The blockchain based decentralized cloud storage system divides users files into small chunks of a data in the form of blocks.

Each block is then encrypted with a unique hash or with public-private keys.

Some blockchain-based storage systems use tokens or cryptocurrencies to incentivize node operators and users to contribute storage space and bandwidth to the network.



Blockchain based Decentralized Data Storage





Advantages of decentralized blockchain storage

Low Costs -> decentralized storage can be more cost-effective than traditional centralized storage, especially for large-scale or long-term data storage.

Data Security -> Decentralized storage relies on encryption and cryptographic techniques, making it highly secure

Scalability -> Decentralized storage systems can potentially scale more easily than centralized ones.



Conclusion

In conclusion the content elaborated about the importance of the decentralized storage networks that are intrinsically based on blockchain technologies. Due to the decentralized and peer-to peer nature, blockchains have the potential to make a significant impact on business across many industries.



References

A Comprehensive Survey on Blockchain-Based Decentralized Storage Networks by
MUHAMMAD IRFAN KHALID¹ , IBTISAM EHSAN ² , AYMAN KHALLEL AL-ANI ³ , JAWAID
IQBAL ⁴ , SADDAM HUSSAIN ^{5,6}, SYED SAJID ULLAH^{7,8}, AND NAYAB

<https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10026822>



Experiment 6 - Smart Contract

```
// SPDX-License-Identifier: MIT
```

```
pragma solidity ^0.8.0;
```

```
contract DecentralizedStorage {
```

```
    // Mapping to store file hashes by user
```

```
    mapping(address => string[]) private userFiles;
```

```
    event FileUploaded(address indexed user, string fileHash);
```

```
    modifier fileExists(address user, string memory fileHash) {
```

```
        bool exists = false;
```

```
        for (uint i = 0; i < userFiles[user].length; i++) {
```

```
            if (keccak256(bytes(userFiles[user][i])) ==  
                keccak256(bytes(fileHash))) {  
                exists = true;  
                break;  
            }  
        }  
        require(exists, "File does not exist.");  
        _;  
    }
```

```
    // Store a file hash associated with the sender's address  
    function uploadFile(string memory fileHash) public {  
        address sender = msg.sender;  
        userFiles[sender].push(fileHash);  
        emit FileUploaded(sender, fileHash);  
    }
```



Experiment 6 - Smart Contract

```
// Store a file hash associated with the sender's address

function uploadFile(string memory fileHash) public {

    address sender = msg.sender;

    userFiles[sender].push(fileHash);

    emit FileUploaded(sender, fileHash); }

function getUserFiles() public view returns (string[] memory) {

    address sender = msg.sender;

    return userFiles[sender];

}

function getFileContents(string memory fileHash) public view fileExists(msg.sender, fileHash) returns (string memory) {

    return fileHash;

}

}
```

Experiment 6 - Smart Contract

• remix

Type the library name to see available commands.
creation of DecentralizedStorage pending...

✓ [vm] from: 0x5B3...eddc4 to: DecentralizedStorage.(constructor) value: 0 wei data: 0x608...20033 logs: 0 hash: 0xe6f...93579

Debug



transact to DecentralizedStorage.uploadFile pending ...

✓ [vm] from: 0x5B3...eddc4 to: DecentralizedStorage.uploadFile(string) 0xd91...39138 value: 0 wei data: 0xe37...00000 logs: 1 hash: 0x43c...ce7c2

Debug



call to DecentralizedStorage.getFileContents

CALL [call] from: 0x5B38Da6a701c568545dCfcB03FcB875f56beddc4 to: DecentralizedStorage.getFileContents(string) data: 0x16e...00000

Debug



call to DecentralizedStorage.getUserFiles

CALL [call] from: 0x5B38Da6a701c568545dCfcB03FcB875f56beddc4 to: DecentralizedStorage.getUserFiles() data: 0x119...42989

Debug



Experiment 6 - Smart Contract

Deployed Contracts

▼ DECENTRALIZEDSTORAGE AT 0x

Balance: 0 ETH

uploadFile

fileHash: Smart

CalldataParameterstransact

getFileContents

fileHash: Smart

CalldataParameterscall

0: string: Smart

getUserFiles

0: string[]: Smart

Low level interactions

CALLDATA

Experiment 7 - Implement the embedding wallet (Metamask) and transaction using Solidity

Sepolia Testnet

Search by Address / Txn Hash / Block / Token

/

Overview

State

More

[This is a Sepolia Testnet transaction only]

Transaction Hash:

0x0864dcf6095761498611dc1bca721787e861c78cf0b9aa76c3e301e594a0ab01

Status:

Success

Block:

4278084 3 Block Confirmations

Timestamp:

48 secs ago (Sep-13-2023 04:25:00 AM +UTC)

From:

0x2031832e54a2200bF67828f560F49A950DB2Ad5

To:

0x18C2931d025BeCd5b0D71D5BCb39258e793F0cbf

Value:

0.5 ETH (\$0.00)

Transaction Fee:

0.000000000092043 ETH (\$0.00)

Gas Price:

0.000004383 Gwei (0.000000000000004383 ETH)

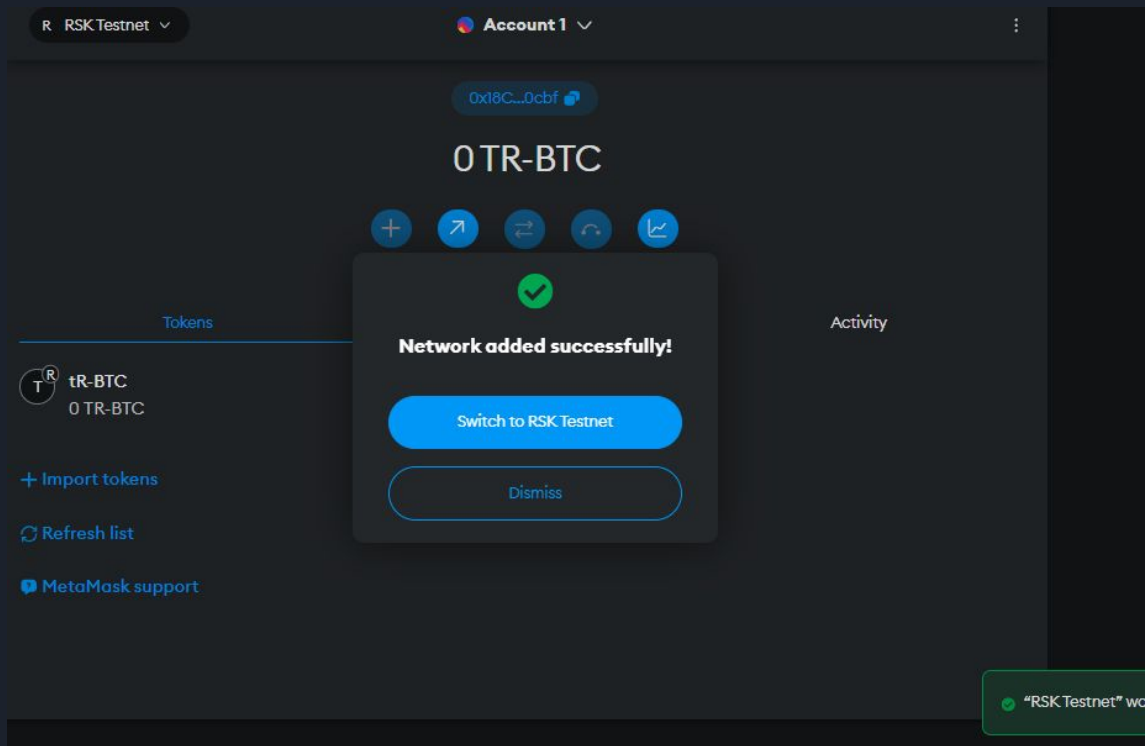
This website uses cookies to improve your experience. By continuing to use this website, you agree to its Terms and Privacy Policy.

Got It!

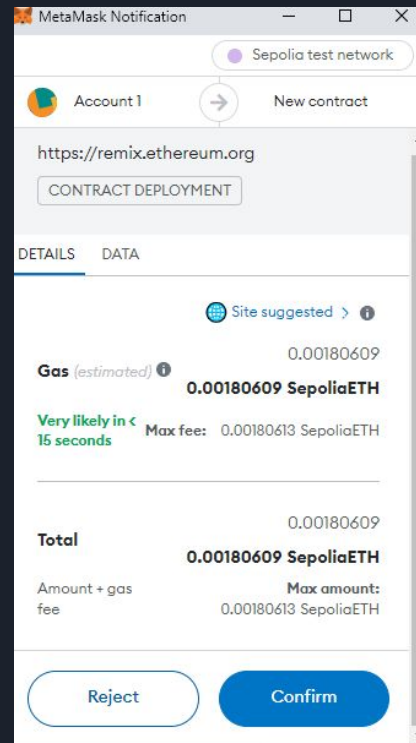
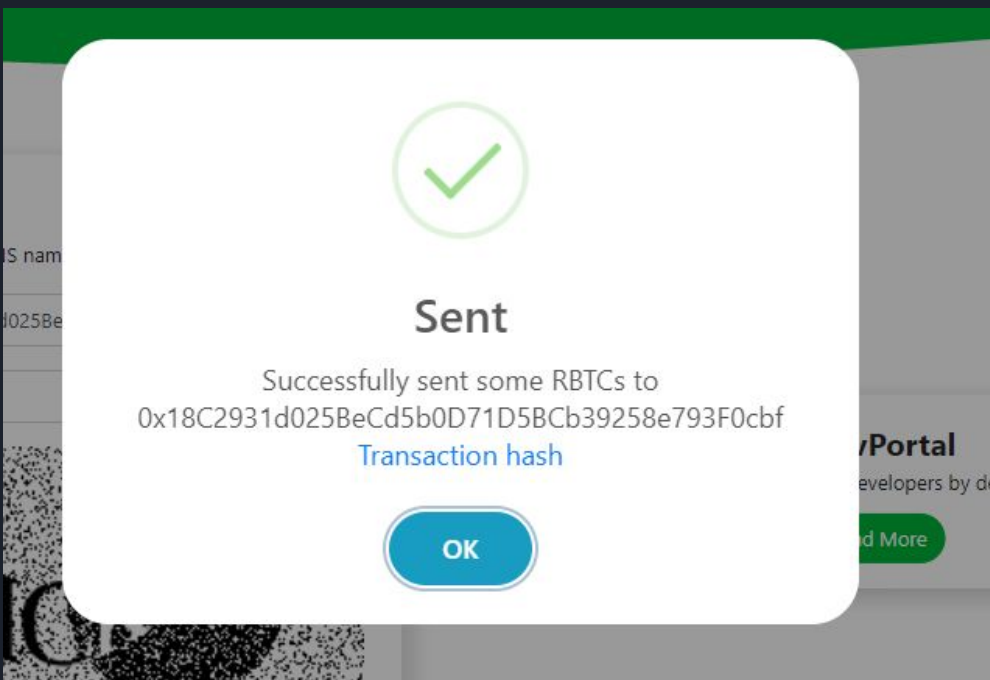
More Details:

+ Click to show more

Experiment 7 - Implement the embedding wallet (Metamask) and transaction using Solidity

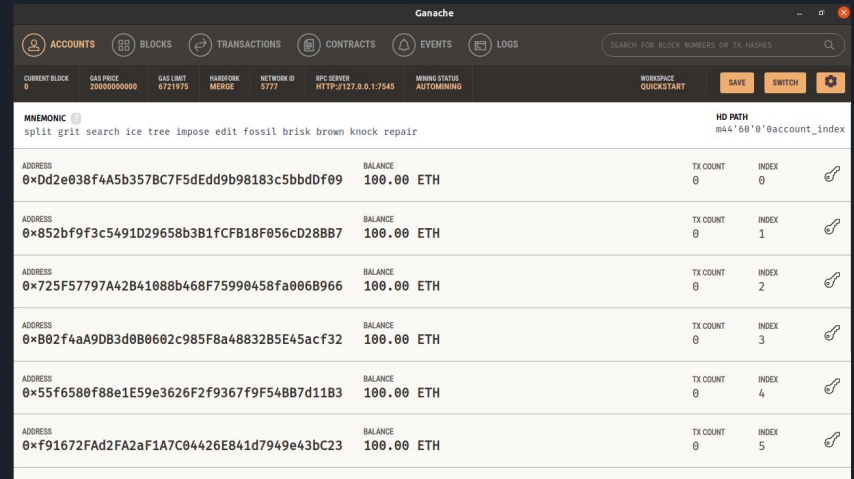


Experiment 7 - Implement the embedding wallet (Metamask) and transaction using Solidity



Experiment 8 - Implement the Blockchain platform Ganache

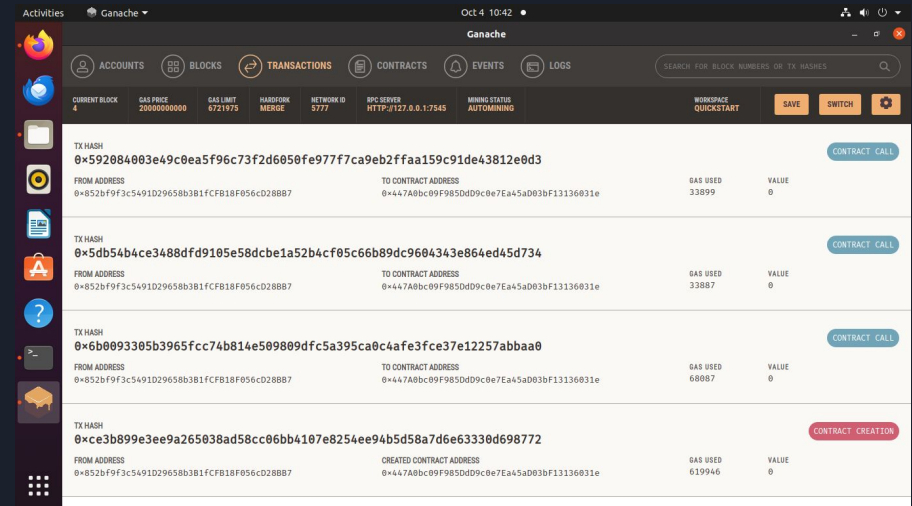
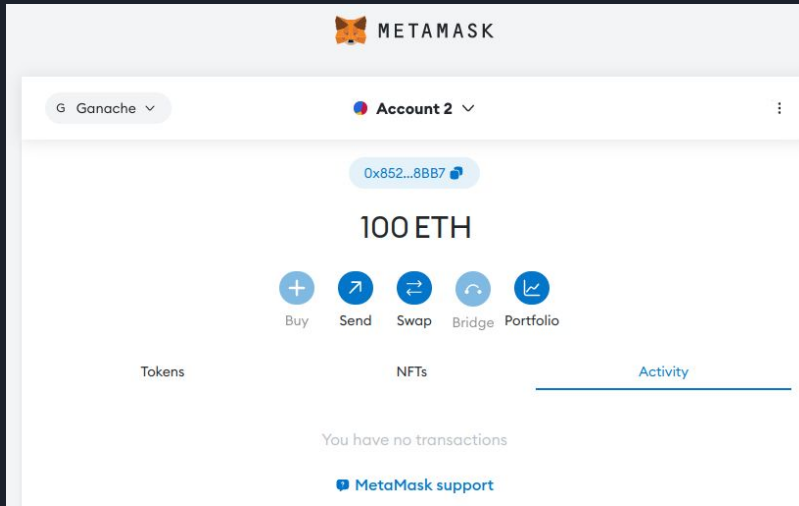
```
student@student-ThinkCentre-neo-50s-Gen-3:~$ cd Downloads
student@student-ThinkCentre-neo-50s-Gen-3:~/Downloads$ sudo chmod a+x ganache-2.7.1-linux-x86_64.AppImage
[sudo] password for student:
student@student-ThinkCentre-neo-50s-Gen-3:~/Downloads$ sudo apt-get install fuse libfuse2
Reading package lists... Done
Building dependency tree
Reading state information... Done
fuse is already the newest version (2.9.9-3).
libfuse2 is already the newest version (2.9.9-3).
The following packages were automatically installed and are no longer required:
 chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi
 libgstreamer-plugins-bad1.0-0 libva-wayland2 linux-headers-5.11.0-27-generic
 linux-hwe-5.11-headers-5.11.0-27 linux-image-5.11.0-27-generic
 linux-modules-5.11.0-27-generic linux-modules-extra-5.11.0-27-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 168 not upgraded.
student@student-ThinkCentre-neo-50s-Gen-3:~/Downloads$ ./ganache-2.7.1-linux-x86_64.AppImage
libva error: /usr/lib/x86_64-linux-gnu/dri/iHD_drv_video.so init failed
libva error: /usr/lib/x86_64-linux-gnu/dri/i965_drv_video.so init failed
10:21:43.859 > checking for update
10:21:45.596 > Update for version 2.7.1 is not available (latest version: 2.7.1, downgrade is disallowed).
```



The screenshot shows the Ganache desktop application. At the top, there's a navigation bar with icons for ACCOUNTS, BLOCKS, TRANSACTIONS, CONTRACTS, EVENTS, and LOGS. Below this is a search bar for block numbers or transaction hashes. The main area displays account information for a selected account. It includes a mnemonic phrase, HD path, and a table of account details.

ADDRESS	BALANCE	TX COUNT	INDEX
0xDd2e038f4A5b357BC7F5dEd9b98183c5bbdDf09	100.00 ETH	0	0
0x852bf9f3c5491D29658b3B1fCFB18F056cD28BB7	100.00 ETH	0	1
0x725F57797A42B41088b468F75990458fa006B966	100.00 ETH	0	2
0xB02f4aA9DB3d0B0602c985F8a48832B5E45acf32	100.00 ETH	0	3
0x55f6580f88e1E59e3626F2f9367f9F54BB7d11B3	100.00 ETH	0	4
0xf91672FAd2FA2aF1A7C04426E84d7949e43bC23	100.00 ETH	0	5

Experiment 8 - Implement the Blockchain platform Ganache



Experiment 8 - Implement the Blockchain platform Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK

4

GAS PRICE

20000000000

GAS LIMIT

6721975

HARDFORK

MERGE

NETWORK ID

5777

RPC SERVER

HTTP://127.0.0.1:7545

MINING STATUS

AUTOMINING

WORKSPACE

QUICKSTART

SAVE

SWITCH

BLOCK

4

MINED ON

2023-10-04 10:42:10

GAS USED

33899

1 TRANSACTION

BLOCK

3

MINED ON

2023-10-04 10:41:59

GAS USED

33887

1 TRANSACTION

BLOCK

2

MINED ON

2023-10-04 10:41:03

GAS USED

68087

1 TRANSACTION

BLOCK

1

MINED ON

2023-10-04 10:36:17

GAS USED

619946

1 TRANSACTION

BLOCK

0

MINED ON

2023-10-04 10:23:35

GAS USED

0

NO TRANSACTIONS



Thankyou