

**Vivekanand Education Society's Institute of Technology**  
**Department of Computer Engineering**



**Subject: Blockchain**

**Semester:7**

**Class: D17B**

<b>Roll No: 31</b>	<b>Name:Tithi Jhamnani</b>
<b>Practical No: 8</b>	<b>Title:Implement the Blockchain platform Ganache</b>
<b>DOP:</b>	<b>DOS:</b>
<b>Grades:</b>	<b>LOs Mapped: LO2</b>
<b>Signature:</b>	



**AIM:** Implement the Blockchain platform Ganache

**Lab Objectives:** To explore Blockchain concepts.

**Lab Outcomes (LO):** Design Smart Contract using Solidity (LO2)

**Task to be performed:**

1. Install Ganache
2. Connect Ganache Accounts with Metamask
3. Connect Remix IDE with Metamask
4. Create a Simple Solidity Smart Contract based on the MiniProject chosen
5. Compile and Deploy the Smart Contract via Ganache Accounts added to Metamask.
6. Check the transaction details on the Ganache Environment
7. Interact with the smart contract

**Theory:**

**What is a Ganache?**

Ganache is not a term specific to blockchain technology itself, but it is a widely used tool in the Ethereum blockchain ecosystem for development and testing purposes. Ganache is essentially a personal blockchain emulator or simulator that allows developers to create a local Ethereum blockchain environment on their own machine. It's often used during the development of smart contracts and decentralized applications (DApps).

Key features of Ganache include:

1. Local Blockchain: Ganache runs a local Ethereum blockchain on your computer, which means you can test and interact with smart contracts without the need for a connection to the main Ethereum network or a testnet.
2. Fast Block Times: Ganache generates new blocks instantly, so you don't have to wait for confirmations during development and testing.
3. Account Management: It provides a set of pre-funded accounts with Ether (the cryptocurrency of the Ethereum network) that you can use for testing transactions and interacting with smart contracts.
4. Ethereum Client API: Ganache provides an Ethereum client API that allows developers to interact with the local blockchain programmatically. This is useful for automated testing.

5. Gas Control: Developers can customize gas limits and gas prices on Ganache to simulate various network conditions.

6. Blockchain Snapshotting: Ganache allows you to snapshot the state of your blockchain at a certain point, making it easy to reset your environment to a known state for testing different scenarios.

7. Graphical User Interface (GUI): Ganache often comes with a user-friendly GUI that makes it accessible to developers who are not comfortable with command-line tools.

Overall, Ganache is a valuable tool for Ethereum developers because it provides a convenient and controlled environment for testing smart contracts and DApps without incurring the cost and complexity associated with deploying and interacting with contracts on the live Ethereum network. It's commonly used in conjunction with development frameworks like Truffle and Remix to streamline the development and testing process.

### **List the steps involved in connecting Ganache Environment with a Metamask and Remix IDE for performing transactions.**

Connecting a Ganache environment with Metamask and Remix IDE for performing transactions involves a series of steps. Here's a step-by-step guide:

#### **1. Install and Set Up Ganache:**

- Download and install Ganache from the official website.
- Run Ganache and create a new workspace. This will start a local Ethereum blockchain.

#### **2. Configure Metamask:**

- If you don't have Metamask installed, you can add it as a browser extension (e.g., for Chrome or Firefox).
- Open Metamask and create or import an Ethereum account. Make sure you're on the same network as Ganache (usually, it's set to "localhost:8545" for Ganache).

#### **3. Import Accounts from Ganache to Metamask:**

- In Ganache, you'll see a list of accounts with private keys. You can use these accounts in Metamask for testing.

- In Metamask, click on your account icon, then select "Import Account."
- Paste the private key of one of the Ganache accounts and import it into Metamask. Repeat this for as many accounts as you need.

#### 4. Configure Remix to Connect to Ganache:

- Open Remix in your web browser or install Remix locally.
- In Remix, go to the "Settings" tab.
- Under "Environment," select "Web3 Provider" as the environment.
  - In the "Web3 Provider Endpoint" field, enter the URL for Ganache (usually "http://localhost:8545" by default).

#### 5. Connect Remix to Metamask (Optional):

- If you want to use Metamask for transaction signing within Remix, you can set it up:
- In Remix, go to the "Settings" tab.
- Under "Plugin," select "Metamask" as the plugin.
- Make sure Metamask is unlocked and connected to the same Ganache network.

#### 6. Write and Deploy Smart Contracts:

- Write your Ethereum smart contracts in Remix's code editor.
- Compile and deploy your contracts using Remix's built-in development environment.

#### 7. Interact with Smart Contracts:

- Once your contracts are deployed, you can interact with them through Remix. You can use Metamask for transaction signing if you've configured it in Remix.

#### 8. Perform Transactions:

- In Remix, you can call functions on your deployed contracts and send transactions.
- Metamask will prompt you to confirm and sign transactions.

#### 9. Monitor Transactions and Balances:

- You can monitor the status of your transactions in both Remix and Ganache.
- Ganache will also display the updated balances of accounts as transactions are processed.

### **Conclusion:**

In conclusion, connecting Ganache with Metamask and Remix IDE offers Ethereum developers a powerful and convenient environment for testing and developing smart contracts and

decentralized applications. With Ganache's local blockchain simulation, Metamask's account management and transaction signing capabilities, and Remix's development tools, developers can efficiently create, deploy, and test their blockchain solutions without the need for real Ethereum network interactions, streamlining the development process and ensuring code reliability.

Change execution mode:

```
drishti@drishti-Inspiron-5502:~/Downloads$ sudo chmod a+x ganache-2.7.1-linux-x86_64.AppImage
[sudo] password for drishti:
```

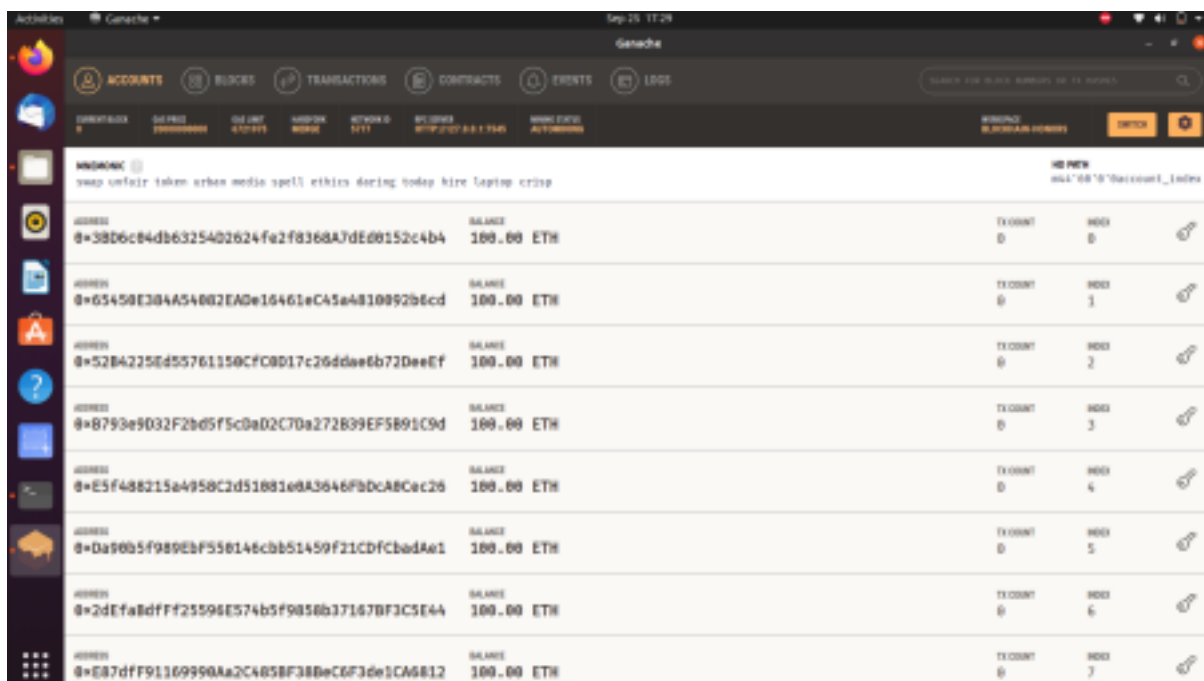
Install libfuse2

```
drishti@drishti-Inspiron-5502:~/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).
fuse set to manually installed.
libfuse2 is already the newest version (2.9.9-3).
libfuse2 set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 223 not upgraded.
```

Run the ganache image

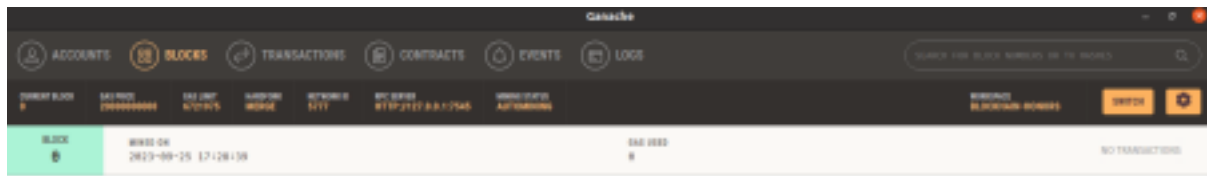
```
drishti@drishti-Inspiron-5502:~/Downloads$ ./ganache-2.7.1-linux-x86_64.AppImage
17:20:57.237 > Checking for update
17:20:57.252 > Generated new staging user ID: 4d5758e5-098a-5203-ac78-940752ae7c58
17:21:00.374 > Update for version 2.7.1 is not available (latest version: 2.7.1, downgrade is disallowed).
```

Accounts created in ganache

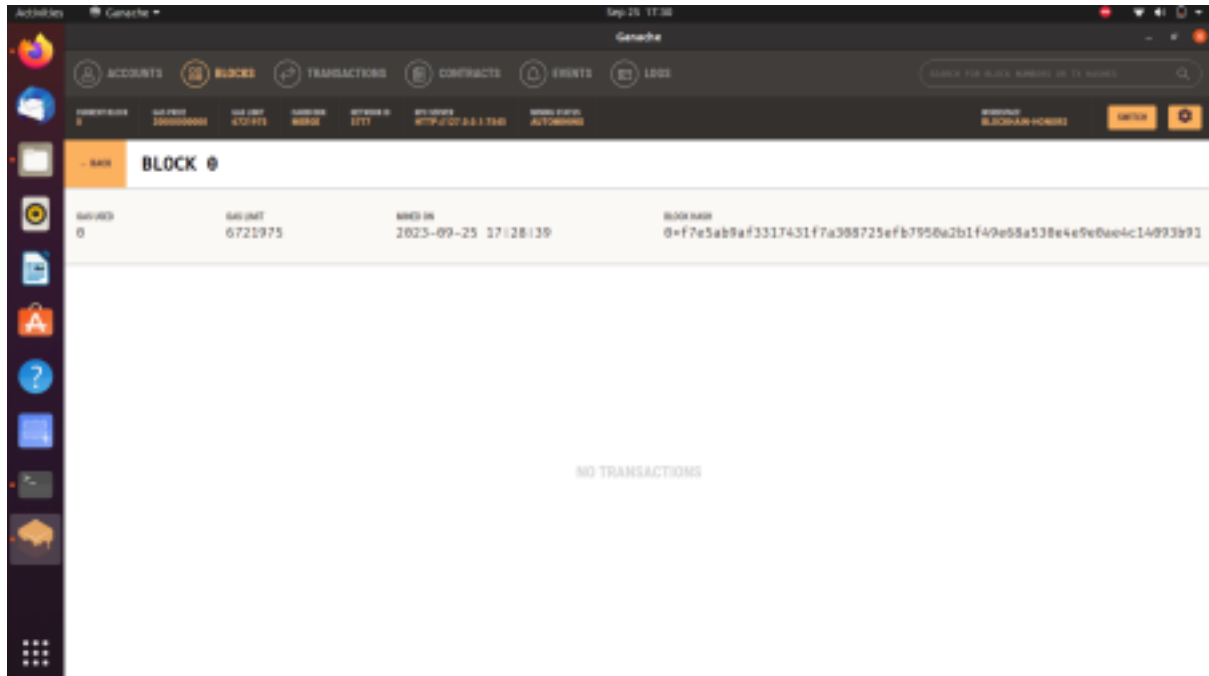


ADDRESS	BALANCE	TX COUNT	INDEX
0x38D6c84db6325402624fe2f8368A7dE0152c4b4	100.00 ETH	0	0
0x65450E304A54062EADe16461eCA5e4810092b6cd	100.00 ETH	0	1
0x52B4225Ed55761150CfC0D17c26ddee6b72DeeEf	100.00 ETH	0	2
0xB793e9032F2bd5f5c0aD2C70a272B99EF5891C9d	100.00 ETH	0	3
0xE5F488215e4958C2d51081e0A3646FbDcA8Cec26	100.00 ETH	0	4
0xDa90b5f989EbF558146cb51459f21CdfCbadAe1	100.00 ETH	0	5
0x2dEfaBdFFf25598E574b5f9058b37167BF3C5E44	100.00 ETH	0	6
0xE87dfF91169990Aa2C405BF38DeC6F3de1CA6812	100.00 ETH	0	7

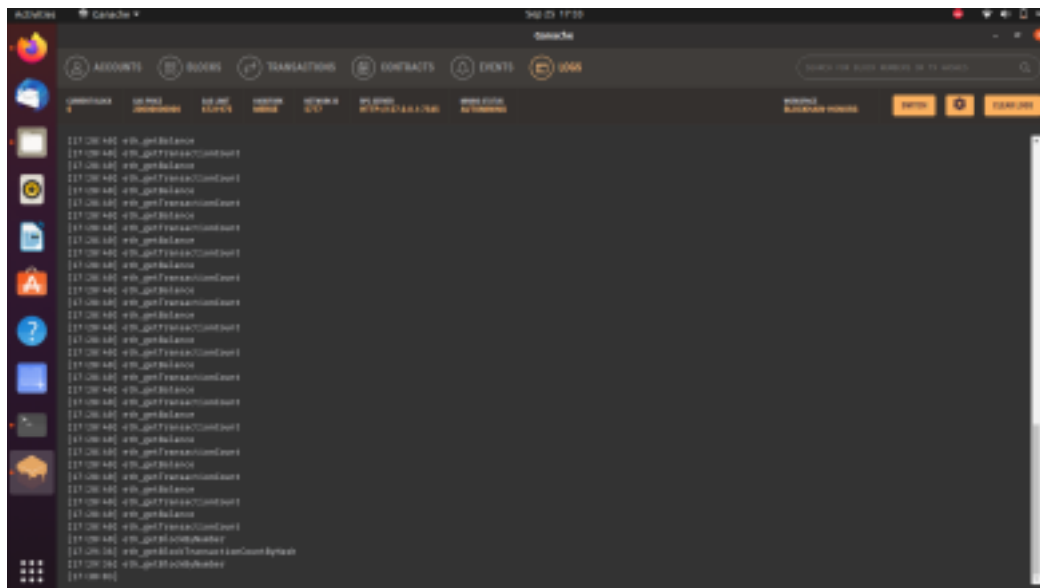
Genesis block created



Contents of block 0



Logs



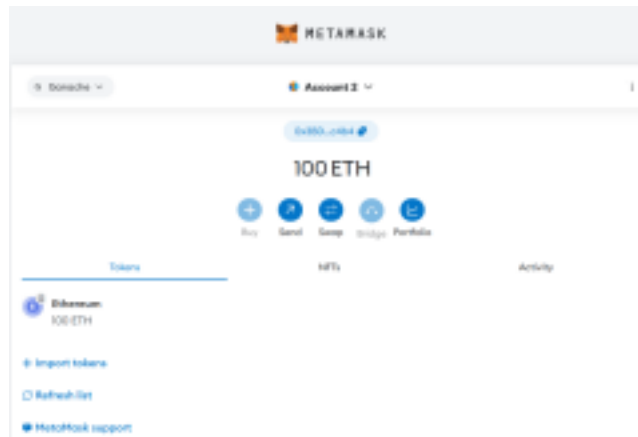
Adding Ganache network to metamask

Copying private key of account from ganache

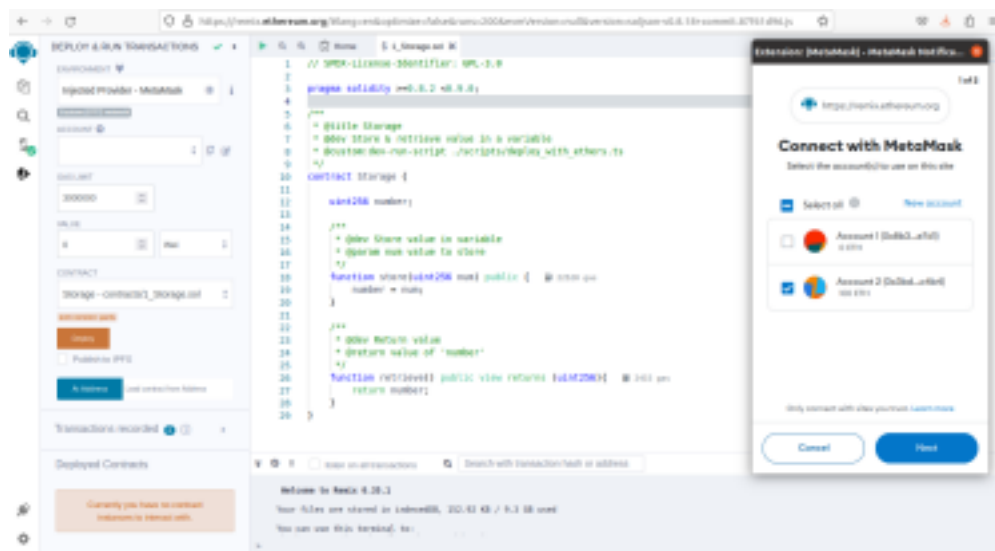
Pasting the private key while importing account on metamask

Account added in metamask

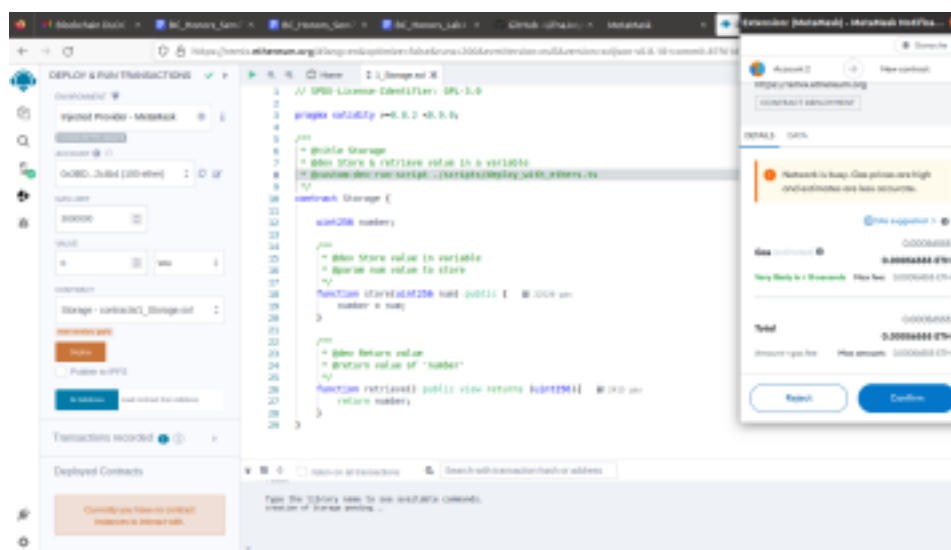




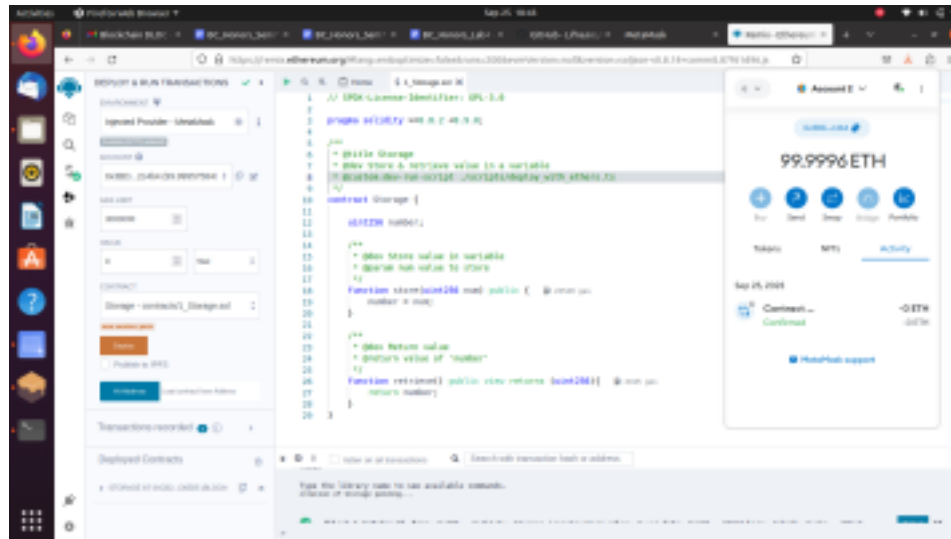
Connecting metamask with remix ide



Deploying smart contract with metamask wallet



## Account status after contract deployment



## Transaction count increased to 1 for account 1

Executive

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LINKS

SEARCH FOR BLOCK NUMBER OR TX HASH

ACCOUNT BALANCE

LOG TRANSACTIONS

ACCOUNT LOGS

TRANSACTION HISTORY

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## Block added after deploying contract

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK

1

GAS PRICE

200000000000

GAS LIMIT

6721975

HARDFORK

MERGE

NETWORK ID

5777

RPC SERVER

HTTP://127.0.0.1:7545

MINING STATUS

AUTOMINING

WORKSPACE

BLOCKCHAIN-HONORS

SWITCH

BLOCK

1

MINED ON

2023-09-25 18:36:24

GAS USED

125677

1 TRANSACTION

BLOCK

0

MINED ON

2023-09-25 17:28:39

GAS USED

0

NO TRANSACTIONS

## Contents of block 1

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

CURRENT BLOCK

1

GAS PRICE

2000000000

GAS LIMIT

6721975

HARDFORK

MERGE

NETWORK ID

5777

RPC SERVER

HTTP://127.0.0.1:7545

MINING STATUS

AUTOMINING

WORKSPACE

BLOCKCHAIN-HONORS

SWITCH

BACK

BLOCK 1

GAS USED

125677

GAS LIMIT

6721975

MINED ON

2023-09-25 18:36:24

BLOCK HASH

0xcbe23c063181f619ccaa66bdb2f9e851e56a9f342e03f01fdd2faac9f14775c7

TX HASH

0x3ef2d624adda27d645e9366e3c3f2c84d9e61fc76e07d396360a439f14d2fe3a

CONTRACT CREATION

FROM ADDRESS

0x3BD6c04db63254D2624fe2f8368A7dEd0152c4b4

CREATED CONTRACT ADDRESS

0xCb2191C283D756580eBF36aa886B166a431D6Eb5

GAS USED

125677

VALUE

0

## Transaction added after deployment of contract

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

CURRENT BLOCK

1

GAS PRICE

2000000000

GAS LIMIT

6721975

HARDFORK

MERGE

NETWORK ID

5777

RPC SERVER

HTTP://127.0.0.1:7545

MINING STATUS

AUTOMINING

WORKSPACE

BLOCKCHAIN-HONORS

SWITCH

BACK

TX 0x3ef2d624adda27d645e9366e3c3f2c84d9e61fc76e07d396360a439f14d2fe3a

SENDER ADDRESS

0x3BD6c04db63254D2624fe2f8368A7dEd0152c4b4

CREATED CONTRACT ADDRESS

0xCb2191C283D756580eBF36aa886B166a431D6Eb5

CONTRACT CREATION

VALUE

0.00 ETH

GAS USED

125677

GAS PRICE

3375000000

GAS LIMIT

125677

MINED IN BLOCK

1

TX DATA

0x608060405234801561001057600080fd5b50610150006100206000396000f3fe608060405234801561001057600080fd5b50600436106100365760003560e01c00632e64cec11461003b5780630057361d14610059575b600080fd5b1004361007565b60405161005091906100a1565b60405180918390f35b610073600480360381019061006e91906100ed565b61007e565b005b60008054905090565b006000819055580565b6000819050919050565b61009b81610088565b82525050565b60006020820190506100b660008030184610092565b92915050565b600080fd5b6100ca81610088565b81146100d557600080fd5b50565b6000813590506100e7816100c1565b92915050565b600060208284031215610103576101026100bc565b5b6000610111848285016100d8565b9150509291505056fea2646970667358221220322c78243e61b783558509c9cc22cb8493dde6925aa5e89a808cdf6e22f279ef164736f6c63430008120033

## Executing a function in the smart contract

Transactions recorded

Deployed Contracts

STORAGE AT 0xcbe2\_d8eb5 (BLOCK)

Balance: 0 ETH

store

63

retrieve

Low level interactions

CALLDATA

Transact

Welcome to Remix 0.35.1

Your files are stored in indexedDB, 152.92 KB / 9.3 GB used

You can use this terminal to:

• Check transactions details and start debugging.

• Execute JavaScript scripts:

• Input a script directly in the command line interface

• Select a JavaScript file in the file explorer and then run 'remix.execute()' or 'remix.executeCurrent()' in the command line interface

• Right click on a JavaScript file in the file explorer and then click 'Run'

The following libraries are accessible:

• web3\_version 1.3.2

• ethers.js

• remix

Type the library name to see available commands.

creation of Storage pending...

[block:1 txIndex:0] from: 0x3BD...2c4b4 to: Storage.(constructor) value: 0 wei data: 0x608...20033 logs: 0 hash: 0xcbe...775c7

transact to Storage.store pending ...

Debug

## Account status after performing function in the smart contract

The screenshot displays the Remix IDE interface. On the left, the 'DEPLOY & RUN TRANSACTIONS' panel shows a contract named 'Storage - contracts/1\_Storage.sol' with a balance of 0 ETH. The 'Deployed Contracts' section shows a 'store' function with a value of 63. The main editor shows the Solidity code for the 'Storage' contract. A MetaMask overlay on the right shows the account 'Account 2' with a balance of 99.9994 ETH and a list of transactions.

```
1 // SPDX-License-Identifier: GPL-3.0
2
3 pragma solidity >=0.8.2 <0.9.0;
4
5 /**
6  * @title Storage
7  * @dev Store & retrieve value in a variable
8  * @custom:dev-run-script ./scripts/deploy_with_ethers.ts
9  */
10 contract Storage {
11
12     uint256 number;
13
14     /**
15      * @dev Store value in variable
16      * @param num value to store
17     */
18     function store(uint256 num) public {
19         number = num;
20     }
21
22     /**
23      * @dev Retrieve value from the storage
24      * @return stored value
25     */
26     function retrieve() public view returns (uint256) {
27         return number;
28     }
29 }
```

## Transaction count increased to 2

Ganache					
ACCOUNTS   BLOCKS   TRANSACTIONS   CONTRACTS   EVENTS   LOGS					
CURRENT BLOCK 2   GAS PRICE 20000000000   GAS LIMIT 6721975   HARDFORK MERGE   NETWORK ID 5777   RPC SERVER HTTP://127.0.0.1:7545   MINING STATUS AUTOMINING   WORKSPACE BLOCKCHAIN-HONORS   SWITCH   ⚙️					
MNEMONIC swap unfair token urban media spell ethics daring today hire laptop crisp			HD PATH m44'60'0"0account_index		
ADDRESS 0x3BD6c04db63254D2624fe2f8368A7dEd0152c4b4	BALANCE 100.00 ETH	TX COUNT 2	INDEX 0		
ADDRESS 0x65450E384A54082EADe16461eC45a4810092b6cd	BALANCE 100.00 ETH	TX COUNT 0	INDEX 1		
ADDRESS 0x52B4225Ed55761150CfC0D17c26ddae6b72DeeEf	BALANCE 100.00 ETH	TX COUNT 0	INDEX 2		
ADDRESS 0xB793e9D32F2bd5f5cDaD2C7Da272B39EF5B91C9d	BALANCE 100.00 ETH	TX COUNT 0	INDEX 3		
ADDRESS 0xE5f488215a4958C2d51081e0A3646FbDcA0Cec26	BALANCE 100.00 ETH	TX COUNT 0	INDEX 4		
ADDRESS 0xDA90b5f989EbF550146cbb51459f21CDfCbadAe1	BALANCE 100.00 ETH	TX COUNT 0	INDEX 5		
ADDRESS 0x2dEfaBdfF25596E574b5f9858b37167BF3C5E44	BALANCE 100.00 ETH	TX COUNT 0	INDEX 6		
ADDRESS 0xE87dfF91169990Aa2C485BF38BeC6F3de1CA6812	BALANCE 100.00 ETH	TX COUNT 0	INDEX 7		

Block added

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	MINING STATUS	WORKSPACE	
2	200000000000	6721975	MERGE	5777	HTTP://127.0.0.1:7545	AUTOMINING	BLOCKCHAIN-HONORS	<div>SWITCH</div> <div></div>
BLOCK 2	MINED ON 2023-09-25 18:45:38		GAS USED 43724		1 TRANSACTION			
BLOCK 1	MINED ON 2023-09-25 18:36:24		GAS USED 125677		1 TRANSACTION			
BLOCK 0	MINED ON 2023-09-25 17:28:39		GAS USED 0		NO TRANSACTIONS			

## Contents of block 2

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK

2

GAS PRICE

20000000000

GAS LIMIT

6721975

HARDFOK

MERGE

NETWORK ID

5777

RPC SERVER

HTTP://127.0.0.1:7545

MINING STATUS

AUTOMINING

WORKSPACE

BLOCKCHAIN-HONORS

SWITCH

⚙️

← BACK

BLOCK 2

GAS USED

43724

GAS LIMIT

6721975

MINED ON

2023-09-25 18:45:38

BLOCK HASH

0×7875eb9844352de35ae2db18a40c647fa03ee2be7c0cd2872849b1e9c6f3f70b

TX HASH

0×49f974dc7644868cee5628309418d7e357f8c2b5a3db96c4f8eac4790c0d7657

CONTRACT CALL

FROM ADDRESS

0×38D6c04db3254D624Fe2f863A7dEd0152c4b4

TO CONTRACT ADDRESS

0×Cb2191C283D756580eBF36aa886B166a431D6Eb5

GAS USED

43724

VALUE

0

## Transaction details

ACCOUNTS

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SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK  
2

GAS PRICE  
20000000000

GAS LIMIT  
6721975

HARDFORK  
MERGE

NETWORK ID  
5777

RPC SERVER  
HTTP://127.0.0.1:7545

MINING STATUS  
AUTOMINING

WORKSPACE  
BLOCKCHAIN-HONORS

SWITCH

TX HASH

0x49f974dc7644868cee5628309418d7e357f8c2b5a3db96c4f8eac4790c0d7657

FROM ADDRESS

0x38D6c04db63254D2624fe2f8368A7dEd0152c4b4

TO CONTRACT ADDRESS

0xCb219C283D756580e8F36aa8868166a431D6Eb5

GAS USED

43724

VALUE

0

TX HASH

0x3ef2d624adda27d645e9366e3c3f2c84d9e61fc76e07d396360a439f14d2fe3a

FROM ADDRESS

0x38D6c04db63254D2624fe2f8368A7dEd0152c4b4

CREATED CONTRACT ADDRESS

0xCb219C283D756580e8F36aa8868166a431D6Eb5

GAS USED

125677

VALUE

0