

APPLICATION : Payment DApp for Microtransactions

PROBLEM STATEMENT:

Objective: Develop a payment DApp that allows small payments between accounts.

Key Features:

Write a smart contract to send Ether to a recipient.

Allow users to input recipient address and amount through the DApp UI.

Display transaction hash and confirmation status.

Objectives:

Ether transfers using Solidity, transaction handling, and web3.js integration.

Tools:

Solidity, Truffle, Ganache, MetaMask, and React/HTML.

Application Development Process:

Step→1

→Create a folder with command in command prompt

```
mkdir payment-dapp
```

→Change the directory

```
cd payment-dapp
```

→for creating folders contracts,migrations,test use

```
truffle init
```

Step→2

→**ADD Payment.sol code in contracts folder:**

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

```
pragma solidity ^0.8.0;
```

```
contract Payment {
```

```
    // Function to send Ether
```

```
    function sendEther(address payable _recipient) public payable {
```

```
        require(msg.value > 0, "Amount must be greater than 0");
```

```
        _recipient.transfer(msg.value);
```

```
    }
```

```
}
```

→**ADD 2_deploy_contracts.js** code in migrations folder:

```
const Payment = artifacts.require("Payment");

module.exports = function (deployer) {
  deployer.deploy(Payment);
};
```

→**Changes in the truffle-config.js:**

```
module.exports = {
  networks: {
    development: {
      host: "127.0.0.1", // Localhost (default Ganache)
      port: 7545, // Ganache default port
      network_id: "5777", // Ganache network ID
      gas: 6721975, // Gas limit
      gasPrice: 20000000000, // Gas price (20 Gwei)
    },
  },
  compilers: {
    solc: {
      version: "0.8.21", // Use the same version as your Solidity contract
    },
  },
};
```

Step→3

Compile and migrate truffle into the ganache:

```
→truffle compile
→truffle migrate
→truffle migrate --network development
```

Step→4

Index.html with javascript:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Payment DApp</title>
  <script src="https://cdn.jsdelivr.net/npm/web3/dist/web3.min.js"></script>
  <style>
    body {
      font-family: Arial, sans-serif;
      margin: 20px;
      padding: 0;
      max-width: 600px;
    }
    input {
      margin: 5px 0 10px;
      width: 100%;
      padding: 8px;
      border: 1px solid #ddd;
      border-radius: 4px;
    }
    button {
      padding: 10px 15px;
      background-color: #28a745;
      color: white;
      border: none;
      border-radius: 4px;
      cursor: pointer;
    }
    button:disabled {
      background-color: #ccc;
    }
    .output {
      margin-top: 20px;
      padding: 10px;
      background-color: #f1f1f1;
      border: 1px solid #ddd;
      border-radius: 4px;
    }
  </style>
</head>
<body>
  <h1>Payment DApp</h1>
  <div>
```

```

<label for="recipient">Recipient Address:</label>
<input type="text" id="recipient" placeholder="0xRecipientAddress">
</div>
<div>
<label for="amount">Amount (in Ether):</label>
<input type="text" id="amount" placeholder="Amount in Ether">
</div>
<button id="sendButton" disabled>Send Ether</button>
<div class="output">
<p><strong>Transaction Hash:</strong> <span id="transactionHash">N/A</span></p>
<p><strong>Status:</strong> <span id="status">N/A</span></p>
</div>

```

```

<script>
let web3;
let contract;
let account;

```

```

// Replace this with your deployed contract's address
const contractAddress = "0x8fF92762d279496Dda387F0d649C1e8cc4a207ac"; //
Example: 0x1234567890abcdef...

```

```

// Function to initialize web3
async function initializeWeb3() {
  // Connect to Ganache
  web3 = new Web3("http://127.0.0.1:7545"); // Local Ganache RPC URL

  // Load accounts from Ganache
  const accounts = await web3.eth.getAccounts();
  account = accounts[0]; // Use the first account by default
  console.log("Connected account:", account);

  // Initialize contract without ABI
  contract = new web3.eth.Contract([], contractAddress); // Empty ABI since we're calling
the method using raw function signatures

  // Enable the send button
  document.getElementById("sendButton").disabled = false;
}

// Function to send Ether
async function sendEther() {
  // Get the recipient address and amount from the input fields
  const recipient = document.getElementById("recipient").value;
  const amount = document.getElementById("amount").value;

  // Validate inputs
  if (!recipient || !amount) {

```

```

    alert("Please provide both recipient address and amount.");
    return;
}

try {
    // Convert Ether to Wei (smallest unit in Ethereum)
    const valueInWei = web3.utils.toWei(amount, "ether");

    // Construct the raw function signature for the `sendEther(address)` method
    const functionSignature = web3.eth.abi.encodeFunctionCall(
        {
            name: "sendEther",
            type: "function",
            inputs: [{ type: "address", name: "_recipient" }]
        },
        [recipient]
    );

    // Send the transaction
    const transaction = await web3.eth.sendTransaction({
        from: account,
        to: contractAddress,
        value: valueInWei,
        data: functionSignature
    });

    // Display transaction details
    document.getElementById("transactionHash").innerText = transaction.transactionHash;
    document.getElementById("status").innerText = "Transaction Confirmed";
    console.log("Transaction successful:", transaction);
} catch (error) {
    // Handle errors
    console.error("Transaction failed:", error);
    document.getElementById("status").innerText = "Transaction Failed";
}

// Attach the event listener to the Send button
document.getElementById("sendButton").addEventListener("click", sendEther);

// Initialize web3 on page load
window.addEventListener("load", initializeWeb3);
</script>
</body>
</html>

```

Copy the contract address after migrating and keep it in js:

```
const contractAddress = "0x8fF92762d279496Dda387F0d649C1e8cc4a207ac";
```

```
2_deploy_contracts.js
=====

Deploying 'Payment'
-----
> transaction hash: 0xd27dc7b75fa67b31e5dca0387c9db426a81e4de883d147aeb9cc4d13b3b80c3a
> Blocks: 0        Seconds: 0
> contract address: 0xC0feA067A2aBa1311D729Aad619D58813d7760A8
> block number:    16
> block timestamp: 1734509193
> account:         0x3dB21Fd93a68D1b814AD84Bb045d974696f27ae4
> balance:         99.895142156721573647
> gas used:        310281 (0x4bc09)
> gas price:       20 gwei
> value sent:      0 ETH
> total cost:      0.00620562 ETH

> Saving artifacts
-----
> Total cost:      0.00620562 ETH
```

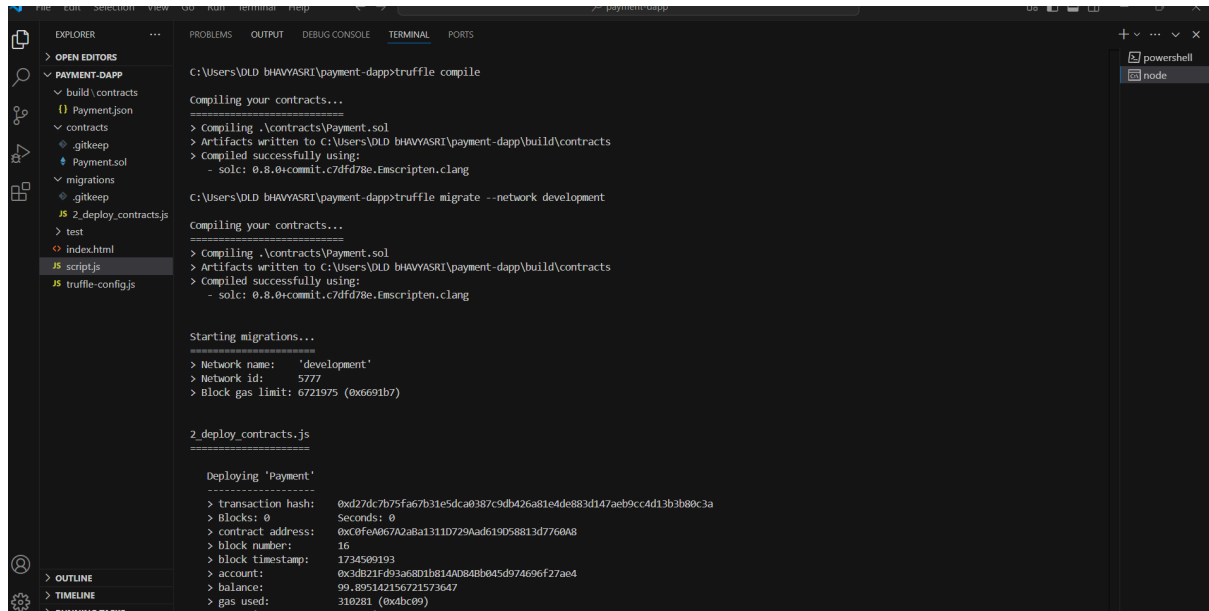
Run:

npx http-server

Copy the url and open in chrome

OUTPUTS:.....

truffle compile



```
C:\Users\ULD BHAVYASRI\payment-dapp>truffle compile

Compiling your contracts...
=====
> Compiling .\contracts\Payment.sol
> Artifacts written to C:\Users\ULD BHAVYASRI\payment-dapp\build\contracts
> Compiled successfully using:
   - solc: 0.8.0+commit.c7dfd78e.Emscripten.clang

C:\Users\ULD BHAVYASRI\payment-dapp>truffle migrate --network development

Compiling your contracts...
=====
> Compiling .\contracts\Payment.sol
> Artifacts written to C:\Users\ULD BHAVYASRI\payment-dapp\build\contracts
> Compiled successfully using:
   - solc: 0.8.0+commit.c7dfd78e.Emscripten.clang

Starting migrations...
=====
> Network name:    'development'
> Network id:     5777
> Block gas limit: 6721975 (0x6691b7)

2_deploy_contracts.js
=====

Deploying 'Payment'
-----
> transaction hash:  0xd27dc7b75fa67b31e5dca0387c9db426a81e4de883d147aeb9cc4d13b3b80c3a
> Blocks: 0
> Seconds: 0
> contract address: 0xc0feA067A2aBa1311D729Ad619058813d7760A8
> block number:    16
> block timestamp: 1734599193
> account:         0x3d821fD93a68D1b814AD848b045d974696f27ae4
> balance:         99.895142156721573647
> gas used:        310281 (0x4bc09)
> gas price:       20 gwei
> value sent:      0 ETH
> total cost:      0.00620562 ETH

Saving artifacts
-----
> Total cost:      0.00620562 ETH

Summary
-----
> Total deployments: 1
> Final cost:       0.00620562 ETH

C:\Users\ULD BHAVYASRI\payment-dapp>npx http-server
Starting up http-server, serving ./

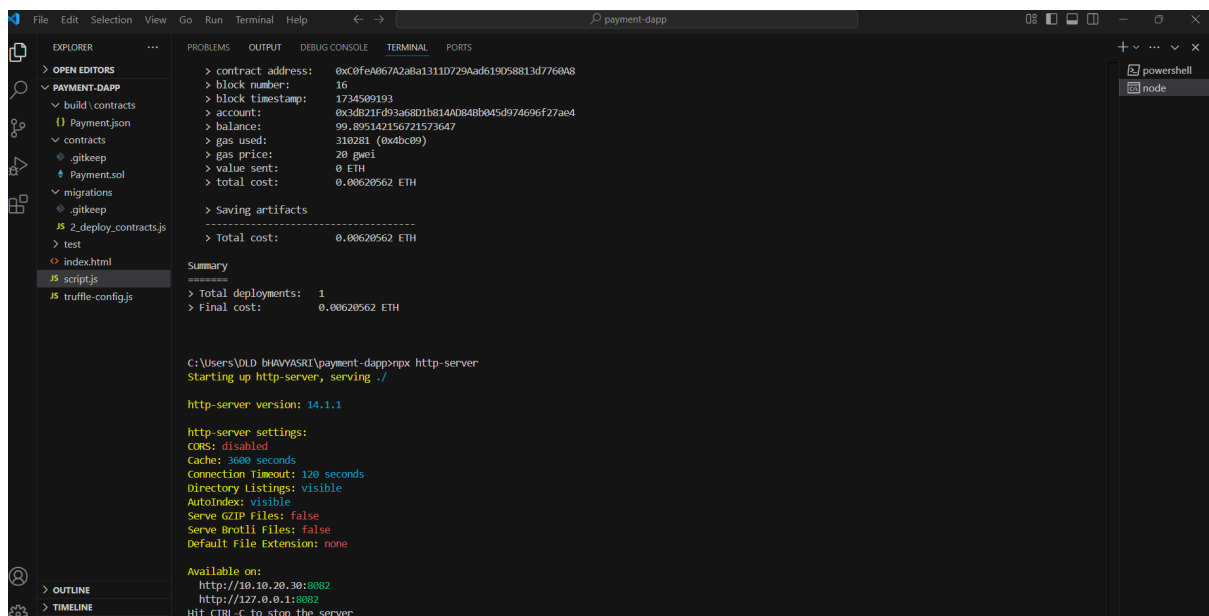
http-server version: 14.1.1

http-server settings:
CORS: disabled
Cache: 3600 seconds
Connection timeout: 120 seconds
Directory Listings: visible
Autoindex: visible
Serve GZIP Files: false
Serve Brotli Files: false
Default File Extension: none

Available on:
http://10.10.20.30:8082
http://127.0.0.1:8082
Hit CTRL-C to stop the server
```

truffle migrate

→truffle migrate --network development



```
> contract address:  0xc0feA067A2aBa1311D729Ad619058813d7760A8
> block number:     16
> block timestamp:   1734599193
> account:           0x3d821fD93a68D1b814AD848b045d974696f27ae4
> balance:           99.895142156721573647
> gas used:          310281 (0x4bc09)
> gas price:         20 gwei
> value sent:        0 ETH
> total cost:        0.00620562 ETH

> Saving artifacts
-----
> Total cost:        0.00620562 ETH

Summary
-----
> Total deployments: 1
> Final cost:        0.00620562 ETH

C:\Users\ULD BHAVYASRI\payment-dapp>npx http-server
Starting up http-server, serving ./

http-server version: 14.1.1

http-server settings:
CORS: disabled
Cache: 3600 seconds
Connection timeout: 120 seconds
Directory Listings: visible
Autoindex: visible
Serve GZIP Files: false
Serve Brotli Files: false
Default File Extension: none

Available on:
http://10.10.20.30:8082
http://127.0.0.1:8082
Hit CTRL-C to stop the server
```

[Payment DApp](#) → npx http-server

Payment DApp

Recipient Address:

0xRecipientAddress

Amount (in Ether):

Amount in Ether

Send Ether

Transaction Hash: N/A

Status: N/A

Payment DApp

Recipient Address:

0x9eBCD84e0997D51D11c590976F36e71bA7D07064

Amount (in Ether):

1

Send Ether

Transaction Hash:

0xac779c08cd9853a06baad51fb7cf264ddca6e29fe2c62e30ad4f8b82410ed700

Status: Transaction Confirmed

Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK6

GAS PRICE2000000000

GAS LIMIT6721975

HARDFORKMERGE

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

MINING STATUSAUTOMINING

WORKSPACE QUICKSTART

SAVE

SWITCH

MNEMONICdivert throw accuse wink under enforce object pretty arrange country stock liquid

HD PATHm44'60'0'0account_index

ADDRESS	BALANCE	TX COUNT	INDEX	
0x8fF92762d279496Dda387F0d649C1e8cc4a207ac	99.73 ETH	6	0	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xa425eaCD37E54218a28f92ffdE414D7382492D3d	100.00 ETH	0	1	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xd4706E22AEc21746aE8d9473361522879d237D7e	100.00 ETH	0	2	
ADDRESS	BALANCE	TX COUNT	INDEX	
0x01B5e6f5b6cCA8ae6b211d0e8AfAe6fDB8f424a6	100.00 ETH	0	3	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xe478868Cf38f0371850d19CBa62f053100CA45fd	100.00 ETH	0	4	
ADDRESS	BALANCE	TX COUNT	INDEX	
0xdFdAd27d9166DE5C5582Cbc20026AFb8e300A461	100.00 ETH	0	5	
ADDRESS	BALANCE	TX COUNT	INDEX	
0x847Ad00AaB5BA83a79607c2c10eB6117F460467c	100.00 ETH	0	6	

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK6

GAS PRICE2000000000

GAS LIMIT6721975

HARDFORKMERGE

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

MINING STATUSAUTOMINING

WORKSPACE QUICKSTART

SAVE

SWITCH

BLOCK 6	MINED ON 2024-12-18 13:47:29	GAS USED 21432	1 TRANSACTION
BLOCK 5	MINED ON 2024-12-18 13:45:14	GAS USED 21432	1 TRANSACTION
BLOCK 4	MINED ON 2024-12-18 13:45:11	GAS USED 21432	1 TRANSACTION
BLOCK 3	MINED ON 2024-12-18 13:44:43	GAS USED 21432	1 TRANSACTION
BLOCK 2	MINED ON 2024-12-18 13:44:03	GAS USED 6721975	1 TRANSACTION
BLOCK 1	MINED ON 2024-12-18 13:43:33	GAS USED 6721975	1 TRANSACTION
BLOCK 0	MINED ON 2024-12-18 13:39:43	GAS USED 0	NO TRANSACTIONS

Transactions after sending payment from html page:

Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK
6

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

TX HASH

0xc9c93846dd845ba924d3305c39eac6b25c71d5290c9f0bf8826283a90a70fed3

FROM ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

TO CONTRACT ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

GAS USED
21432

VALUE
1000000000000000000

CONTRACT CALL

TX HASH

0x537141b15a8c142996c174a7d015a3ae14de3d8a68a2b58490b2b3afa1bee58b

FROM ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

TO CONTRACT ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

GAS USED
21432

VALUE
4000000000000000000

CONTRACT CALL

TX HASH

0x23e7a4dc09e3854fad4f6d86f3815a886eccffba7130493b278515d96dc5d794

FROM ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

TO CONTRACT ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

GAS USED
21432

VALUE
4000000000000000000

CONTRACT CALL

TX HASH

0xb6a99f0c8f53595f5e4a045c0f26f0ff77e02989dbdead01947dea56b685ad24

FROM ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

TO CONTRACT ADDRESS
0x8ff92762d2794960da387f0d649C1e8cc4a207ac

GAS USED
21432

VALUE
2000000000000000000

CONTRACT CALL

TX HASH

0x46beac1852c62ba6933d62fecdc7fca44c4ab83526f0940221bae284f1439fbc

FROM ADDRESS

CREATED CONTRACT ADDRESS

GAS USED

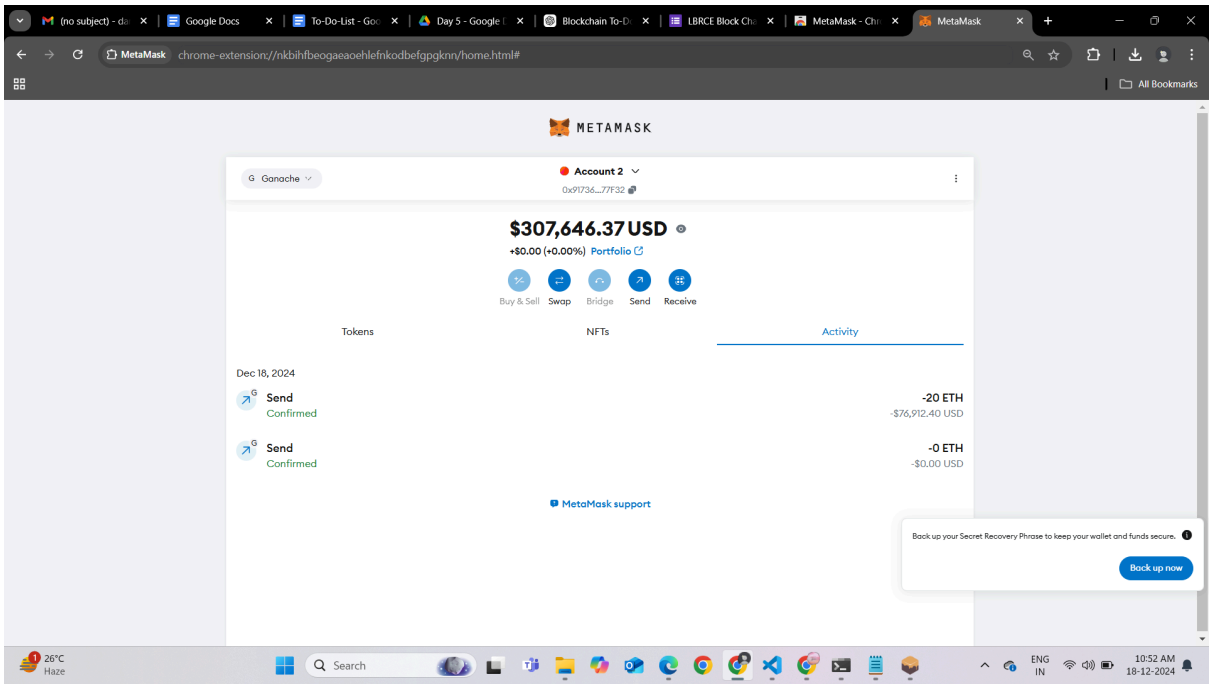
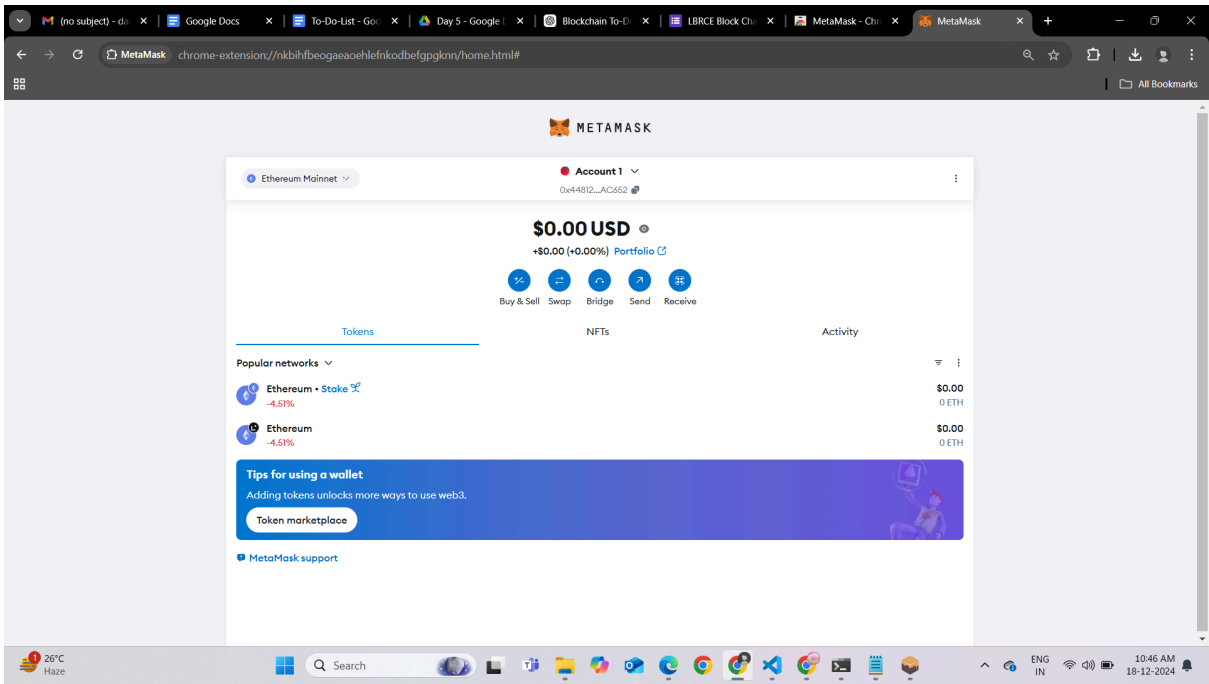
VALUE

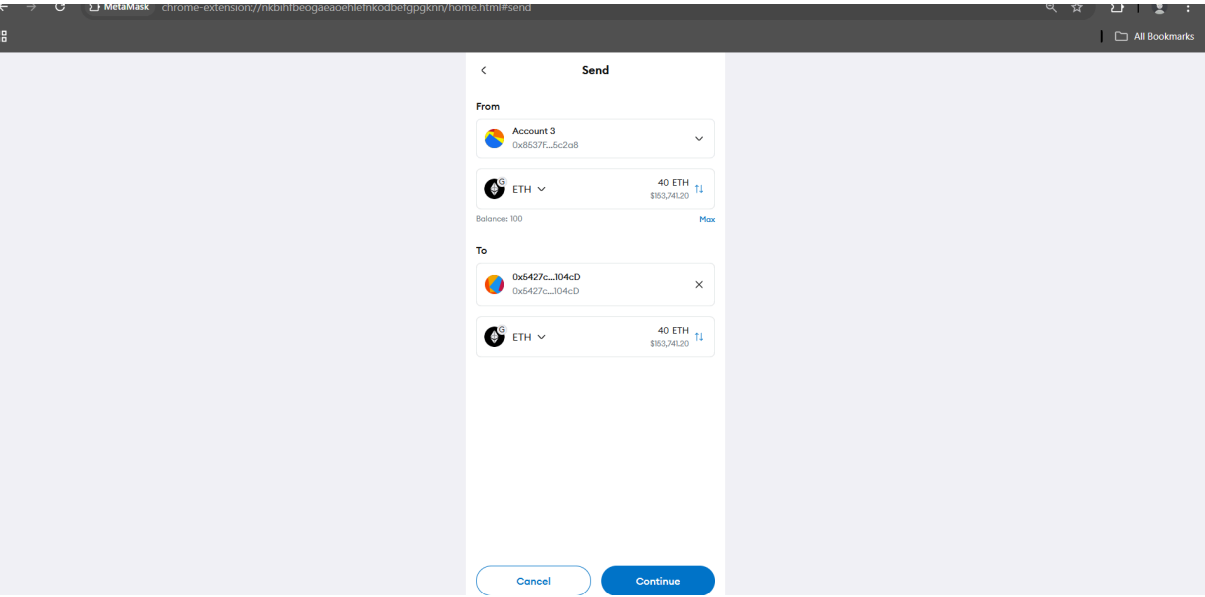
CONTRACT CREATION

Contracts in Ganache:

Ganache				
ACCOUNTS	BLOCKS	TRANSACTIONS	CONTRACTS	EVENTS
LOGS				
SEARCH FOR BLOCK NUMBERS OR TX HASHES				
CURRENT BLOCK 0	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
payment-dapp C:\Users\DL D bhAVYASRI\payment-dapp				
NAME Payment	ADDRESS 0xC7cd314D760c242DC1f992CB023C58Fc4eDd77e2	TX COUNT 0	DEPLOYED	

METAMASK:





BALANCE AFTER TRANSACTION IN METAMASK:

Ganache					
ACCOUNTS BLOCKS TRANSACTIONS CONTRACTS EVENTS LOGS					
CURRENT BLOCK: 17 GAS PRICE: 20000000000 GAS LIMIT: 6721975 HARDFORK: MERGE NETWORK ID: 5777 RPC SERVER: HTTP://127.0.0.1:7545 MINING STATUS: AUTOMINING WORKSPACE: GREASY-QUARTZ SWITCH [Settings]					
MNEMONIC: wise clump agree join organ nature example water mule play very walnut HD PATH: m44'60'0'0account_index					
ADDRESS	BALANCE		TX COUNT	INDEX	[Link]
0x3dB21Fd93a68D1b814AD84Bb045d974696f27ae4	99.90 ETH		16	0	[Link]
ADDRESS	BALANCE		TX COUNT	INDEX	[Link]
0x8537F29F77892106a66d179ec0F10aaA3515c2a8	60.00 ETH		1	1	[Link]
ADDRESS	BALANCE		TX COUNT	INDEX	[Link]
0x043D4E5beCf4009e2377Ad023A7946402BC6f848	100.00 ETH		0	2	[Link]
ADDRESS	BALANCE		TX COUNT	INDEX	[Link]
0x5427c201AE791Ed56Ac16436fe8DEfcA4bC104cD	140.00 ETH		0	3	[Link]
ADDRESS	BALANCE		TX COUNT	INDEX	[Link]
0x558EC4ed9D3963c229bb394feaf84241833E91e6	100.00 ETH		0	4	[Link]

Transaction:

Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK10

GAS PRICE2000000000

GAS LIMIT6721975

HARDFORKMERGE

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

MINING STATUSAUTOMINING

WORKSPACEQUICKSTART

SAVE

SWITCH

TX HASH

0x64822afc6eb7fdd36f85806a1d3eaf57168a1523775967f94ce3d53b2027ae44

VALUE TRANSFER

FROM ADDRESS

0x96E5C2B99F234Dfb37247ef0ADd3bAcDFf5c8f11

TO ADDRESS

0xbc1EFf70B669EE060639c8AeaDd6e84283dfcd3

GAS USED

21000

VALUE

2000000000000000000

TX HASH

0x2aa9901e633cdbaa35d7ebfbdf56af512215976a674f1376b9b0d0ae7bf5ae7d

CONTRACT CREATION

FROM ADDRESS

0x8a8E7ae0D059371a331f0510007E330321ACDf99

CREATED CONTRACT ADDRESS

0x4a9e4E02665fB6b0fcF156C7f3cc9a1c614596

GAS USED

367070

VALUE

0

TX HASH

0x5d79f8601422f9ad8516c0a461fba60e9d44180afc12727976d97951150789fc

CONTRACT CREATION

FROM ADDRESS

0x8a8E7ae0D059371a331f0510007E330321ACDf99

CREATED CONTRACT ADDRESS

0xBD68115fcCaD6106EE91BBED38EAdc13e9B5a6Af

GAS USED

367070

VALUE

0

TX HASH

0x32385396ce8fe49dda4b636094a36c67ce27f613babf366cf7d9c5cab507bdf

CONTRACT CALL

FROM ADDRESS

0x96E5C2B99F234Dfb37247ef0ADd3bAcDFf5c8f11

TO CONTRACT ADDRESS

0xF057cb13FcB710fFD9a131781DC55d7E0111d966

GAS USED

21508

VALUE

0