

Practical No: 06

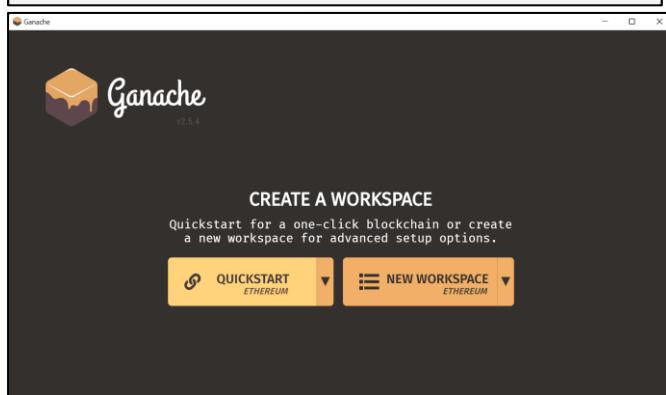
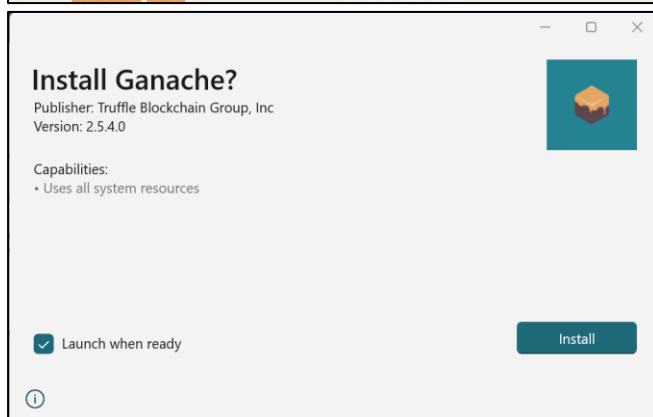
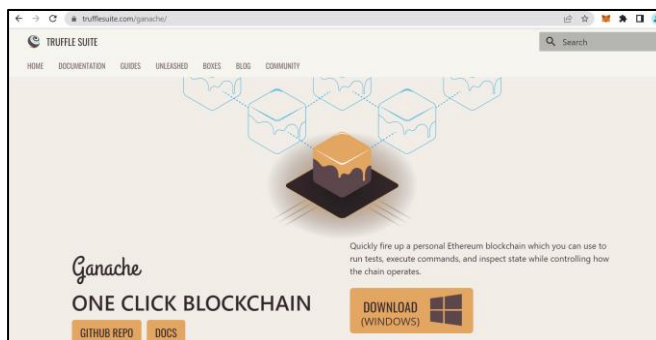
Aim: To implement the installation of Ganache, MetaMask and use Remix IDE and deploy smart contract using injected MetaMask environment.

Theory:

Ganache

Ganache is a private Ethereum blockchain environment that allows to you emulate the Ethereum blockchain so that you can interact with smart contracts in your own private blockchain. Here are some features that Ganache provides: Displays blockchain log output. Provides advanced mining control.

1. Download and install Ganache from <https://www.trufflesuite.com/ganache>



- 2. The main screen shows user accounts with balance of 100 ETH (Ether – a currency for transaction on Ethereum platform). It shows a transaction count of zero for each account since the user has not performed any transactions.**

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK
0

GAS PRICE
20000000000

GAS LIMIT
6721975

HARDWARE
MURGLACIER

NETWORK ID
5777

RPC SERVER
HTTP://127.0.0.1:7545

MINING STATUS
AUTOMATING

WORKSPACE
QUICKSTART

SAVE

SWITCH

MNEMONIC

state measure earn intact they skirt trophy test matrix tobacco awful tissue

HD PATH
m/44'/60'/0'/0'/account_index

ADDRESS

0xF0b3793067e10FDf230062682aaE80303c37403c

BALANCE
100.00 ETH

TX COUNT
0

INDEX
0

ADDRESS

0x16a1b06D0360A4e835D32E00439Ca0F9bAa03712

BALANCE
100.00 ETH

TX COUNT
0

INDEX
1

ADDRESS

0x9f84aB5f1615F5670d93D30355c89cFfd6f74fe3

BALANCE
100.00 ETH

TX COUNT
0

INDEX
2

ADDRESS

0x253F691C23D0C85EF10c3353cA913EE00D713dbd

BALANCE
100.00 ETH

TX COUNT
0

INDEX
3

ADDRESS

0xE6e0E5873Ca9B42a7D00A1F187C72971DdF4C943

BALANCE
100.00 ETH

TX COUNT
0

INDEX
4

ADDRESS

0x003EE7-04FD0730E0-BFF60-6FF0A30A56b0-17B

BALANCE
100.00 ETH

TX COUNT
0

INDEX
5

3. Metamask

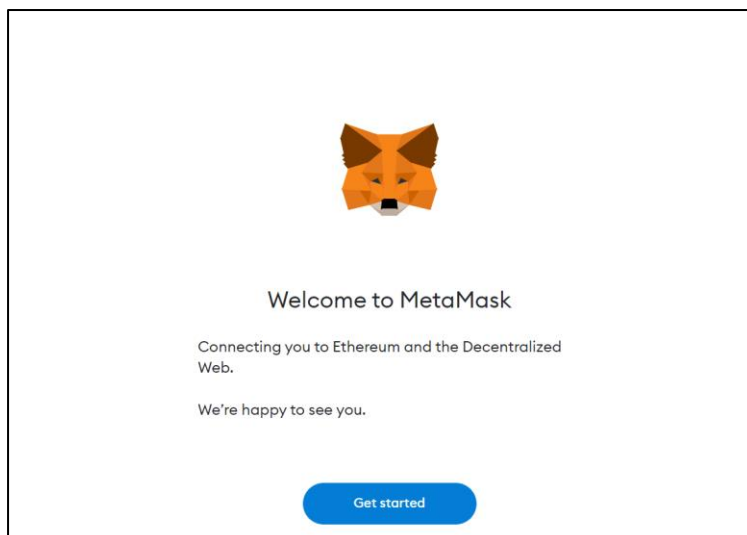
MetaMask is a free web and mobile crypto wallet that allows users to store and swap cryptocurrencies, interact with the Ethereum blockchain ecosystem, and host a growing array of decentralized applications (dApps). It is one of the most widely used crypto applications in the world.

Step 1: Go to Chrome Web Store Extensions Section.

Step 2: Search MetaMask

Step 3: Click the Add to Chrome button. A pop up will ask for permission. Click on add extension.

Step 4: Once installation is complete this page will be displayed. Click on the Get Started button.



Step 5: Click I Agree button to allow data to be collected to help improve MetaMask or else click the No Thanks button. The wallet can still be created even if the user will click on the. No Thanks button.

Help us improve MetaMask


MetaMask would like to gather usage data to better understand how our users interact with the extension. This data will be used to continually improve the usability and user experience of our product and the Ethereum ecosystem.

MetaMask will..


- ✓ Always allow you to opt-out via Settings
- ✓ Send anonymized click & pageview events
- ✗ **Never** collect keys, addresses, transactions, balances, hashes, or any personal information
- ✗ **Never** collect your full IP address
- ✗ **Never** sell data for profit. Ever!

No thanksI agree

Step 6: This is the first time creating a wallet, so click the Create a Wallet button. If there is already a wallet then import the already created using the Import Wallet button.




New to MetaMask?



No, I already have a Secret Recovery Phrase

Import your existing wallet using a Secret Recovery Phrase

Import wallet

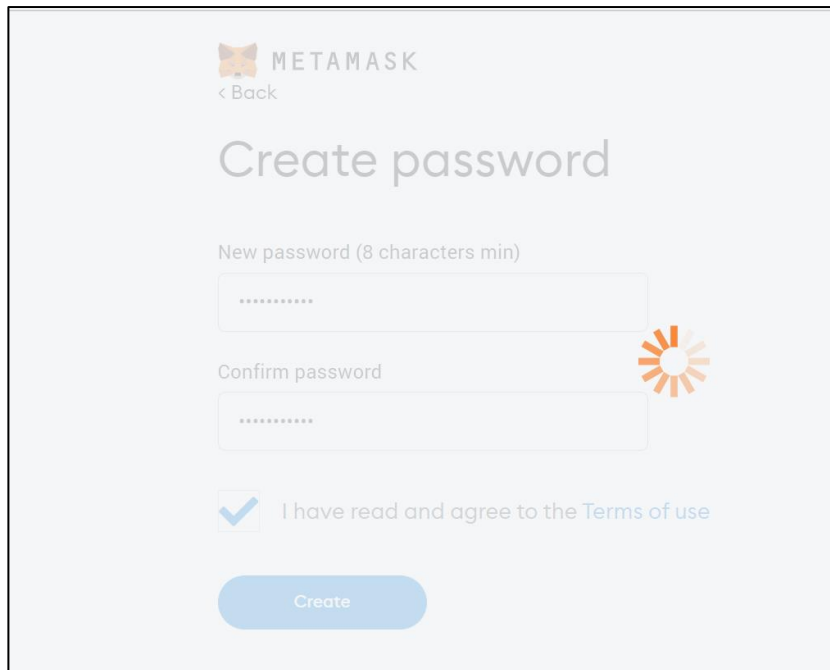


Yes, let's get set up!

This will create a new wallet and Secret Recovery Phrase

Create a wallet

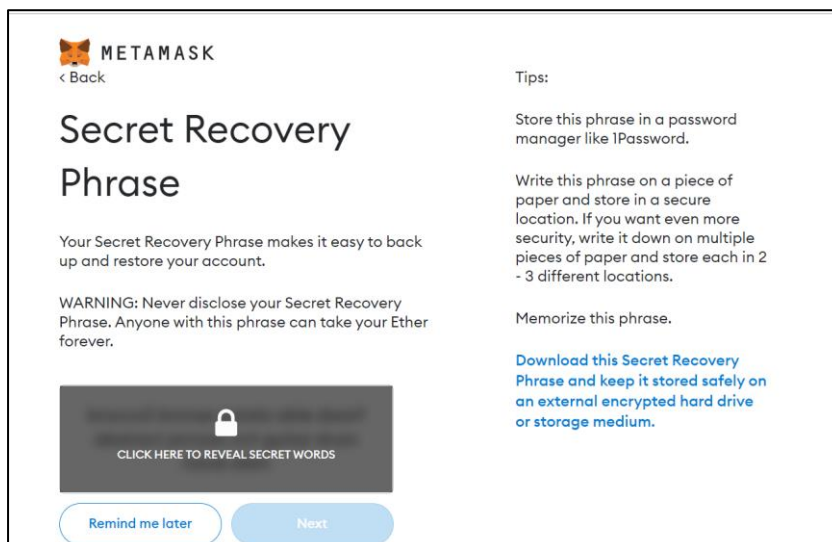
Step 7: Create a password for your wallet. This password is to be entered every time the browser is launched and wants to use MetaMask. A new password needs to be created if chrome is uninstalled or if there is a switching of browsers. In that case, go through the Import Wallet button. This is because MetaMask stores the keys in the browser. Agree to Terms of Use



The image shows the 'Create password' screen in the Metamask mobile app. At the top, there is the Metamask logo and a '< Back' link. The main heading is 'Create password'. Below it, there is a text input field for 'New password (8 characters min)' and another for 'Confirm password'. To the right of the confirm password field is a circular icon with orange rays. Below the input fields is a checkbox with a blue checkmark and the text 'I have read and agree to the Terms of use'. At the bottom is a blue 'Create' button.

Step 8: Click on the dark area which says Click here to reveal secret words to get your secret phrase.

Step 9: This is the most important step. Back up your secret phrase properly. Do not store your secret phrase on your computer. Please read everything on this screen until you understand it completely before proceeding. The secret phrase is the only way to access your wallet if you forget your password. Once done click the Next button.



The image shows the 'Secret Recovery Phrase' screen in the Metamask mobile app. At the top, there is the Metamask logo and a '< Back' link. The main heading is 'Secret Recovery Phrase'. Below it, there is a paragraph: 'Your Secret Recovery Phrase makes it easy to back up and restore your account.' Below that is a 'WARNING: Never disclose your Secret Recovery Phrase. Anyone with this phrase can take your Ether forever.' At the bottom left is a dark grey button with a white padlock icon and the text 'CLICK HERE TO REVEAL SECRET WORDS'. Below this button are two light blue buttons: 'Remind me later' and 'Next'. On the right side of the screen, there is a 'Tips:' section with three bullet points: 'Store this phrase in a password manager like 1Password.', 'Write this phrase on a piece of paper and store in a secure location. If you want even more security, write it down on multiple pieces of paper and store each in 2 - 3 different locations.', and 'Memorize this phrase.' Below the tips is a blue link: 'Download this Secret Recovery Phrase and keep it stored safely on an external encrypted hard drive or storage medium.'

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Roll Number: 07
Block Chain Lab

Step 10: Click the buttons respective to the order of the words in your seed phrase. In other words, type the seed phrase using the button on the screen. If done correctly the Confirm button should turn blue.

Confirm your Secret Recovery Phrase

Please select each phrase in order to make sure it is correct.

awful

east

eternal

gallery

hollow

honey

initial

lyrics

moral


rather

shadow

unknown

Confirm

Step 11: Click the Confirm button. Click on All done button.



Congratulations

You passed the test - keep your Secret Recovery Phrase safe, it's your responsibility!

Tips on storing it safely


- Save a backup in multiple places.
- Never share the phrase with anyone.
- Be careful of phishing! MetaMask will never spontaneously ask for your Secret Recovery Phrase.
- If you need to back up your Secret Recovery Phrase again, you can find it in Settings > Security.
- If you ever have questions or see something fishy, contact our support [here](#).

*MetaMask cannot recover your Secret Recovery Phrase. [Learn more](#).

All done

Step 12: One can see the balance and copy the address of the account by clicking on the Account 1 area.

Account 1
0x5Ec...348F



0ETH

\$0.00 USD

Buy

Send

Swap

Assets

Activity

Portfolio site

0 ETH
\$0.00 USD

New!

Try our [beta portfolio site](#) to keep tabs on your tokens and NFTs across accounts and networks.

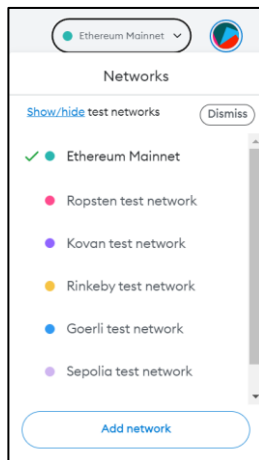
Don't see your token?
[Refresh list](#) or [import tokens](#)

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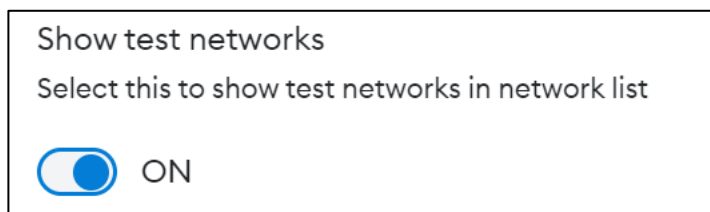
Step 13: Adding Ganache Network to MetaMask.

a. Select Show/Hide test networks and enable Show test networks option. Click on the Networks Dropdown and Select Custom RPC.



b. Fill the network details such as Network Name, RPC Url and Chain Id and Save it.

Note: RPC url is mentioned on your ganache console as RPC Server



Networks > Add a network > Add a network manually

ⓘ A malicious network provider can lie about the state of the blockchain and record your network activity. Only add custom networks you trust.

Network name

New RPC URL

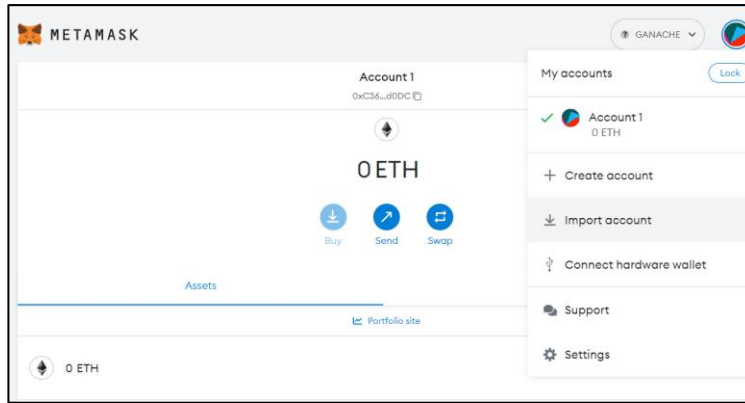
Chain ID ⓘ

This Chain ID is currently used by the Localhost 8545 network.

Currency symbol

The network with chain ID 1337 may use a different currency symbol (CPAY) than the one you have entered. Please verify before continuing.

Block explorer URL (Optional)



Step 14: Importing Accounts.

To Import an account, click on the circular icon at the top – right of your MetaMask Extension and select Import accounts.

a. Copy the private key of your ganache account by clicking on key icon of particular account.

ADDRESS	BALANCE	TX COUNT	INDEX	
0xF0b3793067e10fDF230062682aaE80303c37403c	100.00 ETH	0	0	

ACCOUNT INFORMATION

ACCOUNT ADDRESS
0xF0b3793067e10fDF230062682aaE80303c37403c

PRIVATE KEY
b987b44d37b4570c763ae78f5aad83c9ddae8720bfd19b5d6eef5207ba4be194

Do not use this private key on a public blockchain; use it for development purposes only!

DONE

Import account

Imported accounts will not be associated with your originally created MetaMask account Secret Recovery Phrase. Learn more about imported accounts [here](#).

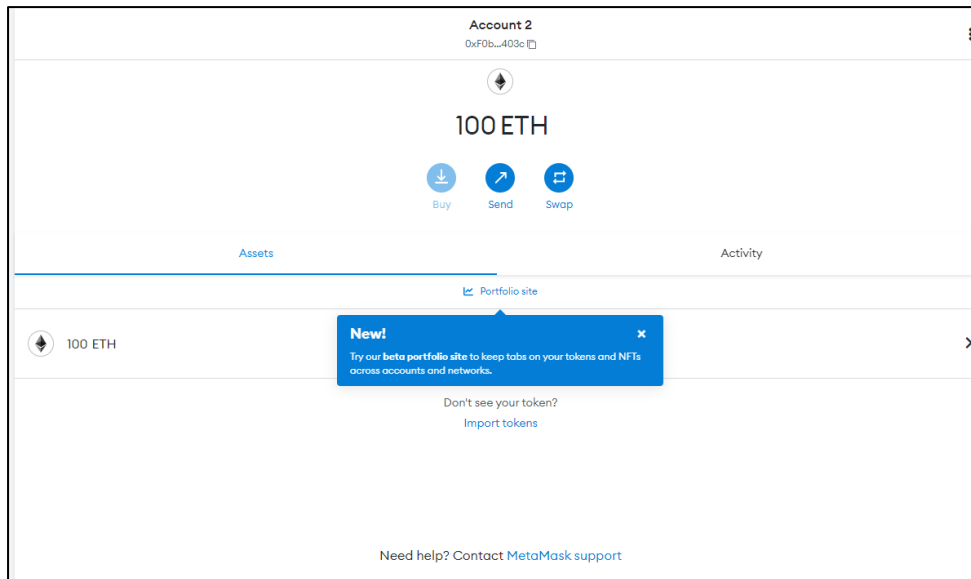
Select Type: Private Key

Enter your private key string here:

.....

Cancel **Import**

- c. Click on import button once private key string is pasted.
d. Once imported you can see it at your MetaMask extension as Account 2.



4. Remix IDE

Remix IDE is an open source application with flexible access to multiple productive plugins, with the facility of intuitive GUIs. It can serve as the ideal companion for developers throughout the smart contract development lifecycle by using a Solidity programming language. Most important of all, Remix can also serve as a promising playground for developing expertise in Ethereum.

Code:

```
pragma solidity ^0.4.2;

contract Election {
    // Model a Candidate
    struct Candidate {
        uint256 id;
        string name;
        uint256 voteCount;
    }
    // Store accounts that have voted
    mapping(address => bool) public voters;
    // Store Candidates and Fetch Candidate
    mapping(uint256 => Candidate) public candidates;
    // Store Candidates Count
    uint256 public candidatesCount;
    // voted event
    event votedEvent(uint256 indexed _candidateId);

    constructor() public {
        addCandidate("N MODI, BJP");
        addCandidate("A kejriwal, AAP");
    }
}
```



```
addCandidate("Rahul G, Congress");
addCandidate("Nikhil, JDS");
}

function addCandidate(string _name) private {
    candidatesCount++;
    candidates[candidatesCount] = Candidate(candidatesCount, _name, 0);
}

function vote(uint256 _candidateId) public {
    // require that they haven't voted before
    require(!voters[msg.sender]);
    // require a valid candidate
    require(_candidateId > 0 && _candidateId <= candidatesCount);
    // record that voter has voted
    voters[msg.sender] = true;
    // update candidate vote Count
    candidates[_candidateId].voteCount++;
    // trigger voted event emit
    emit votedEvent(_candidateId);
}
}
```

Output:

Compile your code and deploy it. Make sure the compiler is 0.4.26 and while deploying the environment should be “Injected Provider-Metamask”

SOLIDITY COMPILER

COMPILER +

0.4.26+commit.4563c3fc

☐ Include nightly builds

☒ Auto compile

☐ Hide warnings

Advanced Configurations >

Compile counter.sol

Compile and Run script

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

Injected Provider - Metamask

Custom (5777) network

ACCOUNT +

GAS LIMIT

3000000

VALUE

0

Wei

CONTRACT (Compiled By Remix)

Election - counter.sol

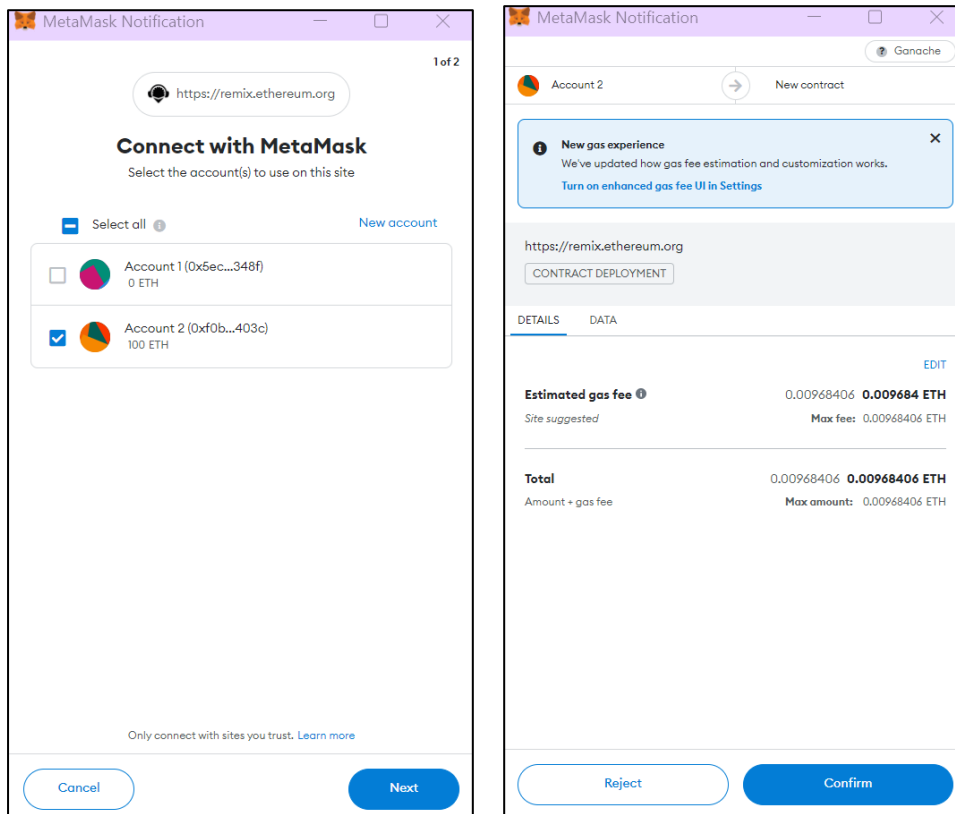
Deploy

☐ Publish to IPFS

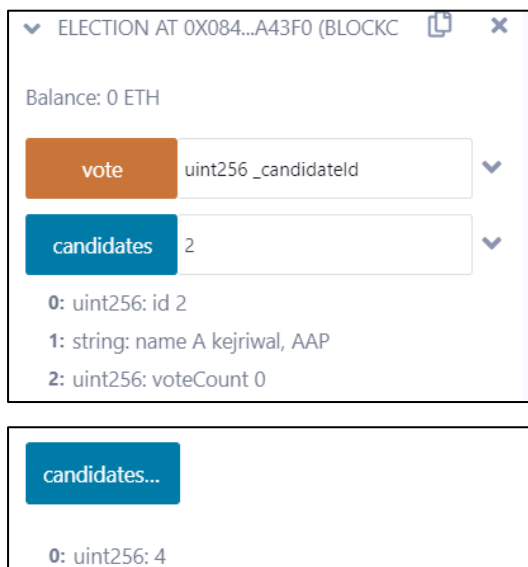
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After clicking on deploy, a pop up will show up. Connect with Metamask.



Details of Candidate 2 and total count of candidates



Voted from this address: false



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0: bool: false

voters 0xF0b3793067e10fDF230062682a ▼

Voted from this address: false

0: bool: true

voters 0xF0b3793067e10fDF230062682a ▼

Vote for candidate 2

vote 2 ▼

Confirm vote transaction

MetaMask Notification

Ganache

Account 2 → 0x084...43f0

New address detected! Click here to add to your address book.

New gas experience
We've updated how gas fee estimation and customization works.
[Turn on enhanced gas fee UI in Settings](#)

https://remix.ethereum.org

0x084...43f0 : VOTE ⓘ

DETAILS DATA HEX

Estimated gas fee ⓘ 0.00132482 **0.001325 ETH**
Site suggested **Max fee:** 0.00132482 ETH

Total 0.00132482 **0.00132482 ETH**
Amount + gas fee **Max amount:** 0.00132482 ETH

Reject Confirm

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Transactions

ADDRESS	BALANCE	TX COUNT	INDEX	
0xF0b3793067e10fDF230062682aaE80303c37403c	99.99 ETH	2	0	

Ganache				
ACCOUNTS	BLOCKS	TRANSACTIONS	CONTRACTS	EVENTS
LOGS	SEARCH FOR BLOCK NUMBERS OR TX HASHES			
CURRENT BLOCK 2	GAS PRICE 20000000000	GAS LIMIT 6721975	HARDFORK MUIRGLACIER	NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	WORKSPACE QUICKSTART	SAVE	SWITCH
TX HASH 0x07a6695b7af656b39ebf02e1d3f73dabe1e6f48f011530b6e72356977469cc94				CONTRACT CALL
FROM ADDRESS 0xF0b3793067e10fDF230062682aaE80303c37403c	TO CONTRACT ADDRESS 0x084d2a9225e3ae37aFf8145Cc98e83cE660A43f0	GAS USED 66241	VALUE 0	
TX HASH 0x8f850349f3d78ee9760487d0b24b8482b501003ffb3e131766e14bcfbf1712ab3				CONTRACT CREATION
FROM ADDRESS 0xF0b3793067e10fDF230062682aaE80303c37403c	CREATED CONTRACT ADDRESS 0x084d2a9225e3ae37aFf8145Cc98e83cE660A43f0	GAS USED 484203	VALUE 0	

Blocks

Ganache				
ACCOUNTS	BLOCKS	TRANSACTIONS	CONTRACTS	EVENTS
LOGS	SEARCH FOR BLOCK NUMBERS OR TX HASHES			
CURRENT BLOCK 2	GAS PRICE 20000000000	GAS LIMIT 6721975	HARDFORK MUIRGLACIER	NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	WORKSPACE QUICKSTART	SAVE	SWITCH
BLOCK 2	MINED ON 2022-10-13 20:58:59	GAS USED 66241	1 TRANSACTION	
BLOCK 1	MINED ON 2022-10-13 20:52:51	GAS USED 484203	1 TRANSACTION	
BLOCK 0	MINED ON 2022-10-13 19:24:15	GAS USED 0	NO TRANSACTIONS	

Conclusion: We have successfully learnt and implemented the installation of Ganache, MetaMask and used Remix IDE to deploy smart contract using injected MetaMask environment.