

# Symbiosis Skills & Professional University

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**Subject Name:** Cryptography & Blockchain

**Subject Code:** CS601

**Assignment:** Skill – 2

**Title:** Installing Truffle and connecting Ganache with MetaMask.

For this assignment, I've taken reference from the following pages:

- <https://www.geeksforgeeks.org/how-to-set-up-ganche-with-metamask/>
- <https://ethereum-blockchain-developer.com/050-supply-chain-project/04-install-truffle/>

## What is Truffle Suite?

Truffle Suite is basically a collection of tools which allows you to develop and deploy smart contracts on the Ethereum blockchain. Truffle Suite includes the Truffle development framework. This provides tools needed to build and test smart contracts, as well as Truffle Boxes, which are pre-built smart contract templates. These can be used as a boilerplate while beginning with new projects.

## What is Ganache?

Ganache is basically a local blockchain, which is a part of the Truffle Suite. It will allow you to easily set up a personal blockchain, on which you can test and experiment. This can be done without the need for an external network.

It is an Ethereum client, that is based on Node.js. It allows you to develop smart contracts. Since it's based on Node.js, it should be installed using NPM (Node Package Manager).

## What is MetaMask?

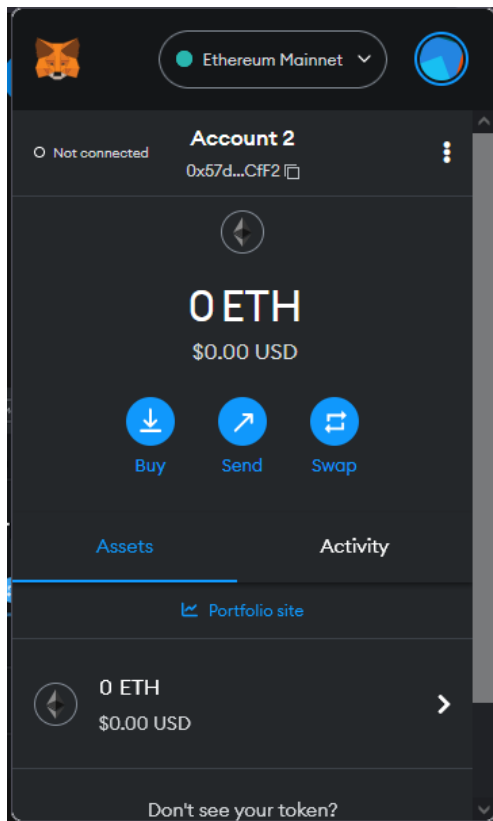
MetaMask is basically a digital wallet which allows you to interact with the Ethereum blockchain. It allows you to securely store your private keys, as well as manage your Ethereum. It's like a middleware between the Ethereum blockchain and you. This enables you to easily make transactions (sending and receiving Ether) without running a full Ethereum node on your machine.

MetaMask can be installed as a browser extension. It supports various browsers, such as Chrome, Firefox, Brave, Edge and Opera. It's also available on iOS and Android devices.

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## Installing MetaMask

To install MetaMask, go to <https://metamask.io/> and install it to your preferred browser. I've already done the installation and created a wallet.



## Installing Truffle

To install Truffle, make sure you have access to NPM (Node Package Manager). I already have NPM (and Node.js) installed on my machine, so I will execute the following command in CMD to install Truffle:


```
npm install -g truffle
```

The `-g` flag stands for “global” installation.

## Installing Ganache

Ganache has a GUI version, as well as a CLI version. To install the GUI version, visit the link <https://trufflesuite.com/ganache/> and download the file. To install the CLI version, simply type and execute the following command in CMD or PowerShell:

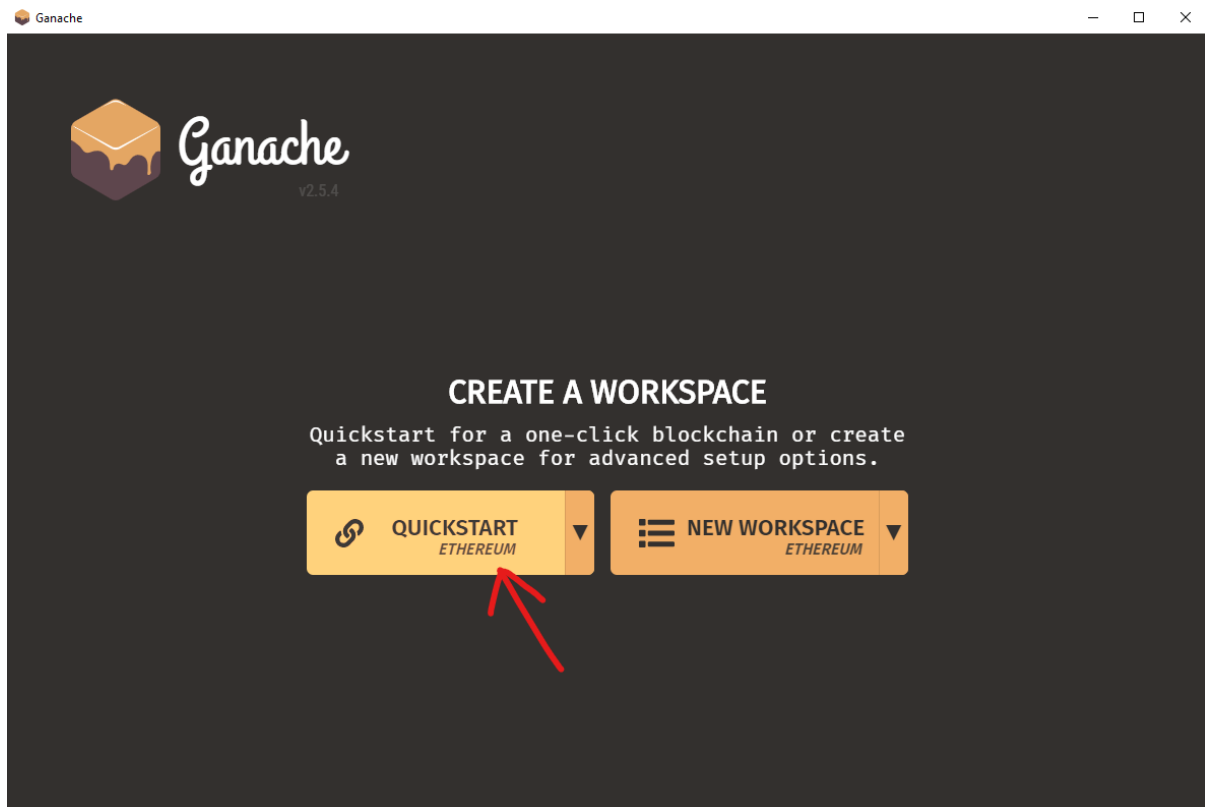
```
npm install -g ganache-cli
```

<input checked="" type="checkbox"/>  Ganache-2.5.4-win-x64.appx	25-01-2023 10:41	APPX File	1,90,991 KB
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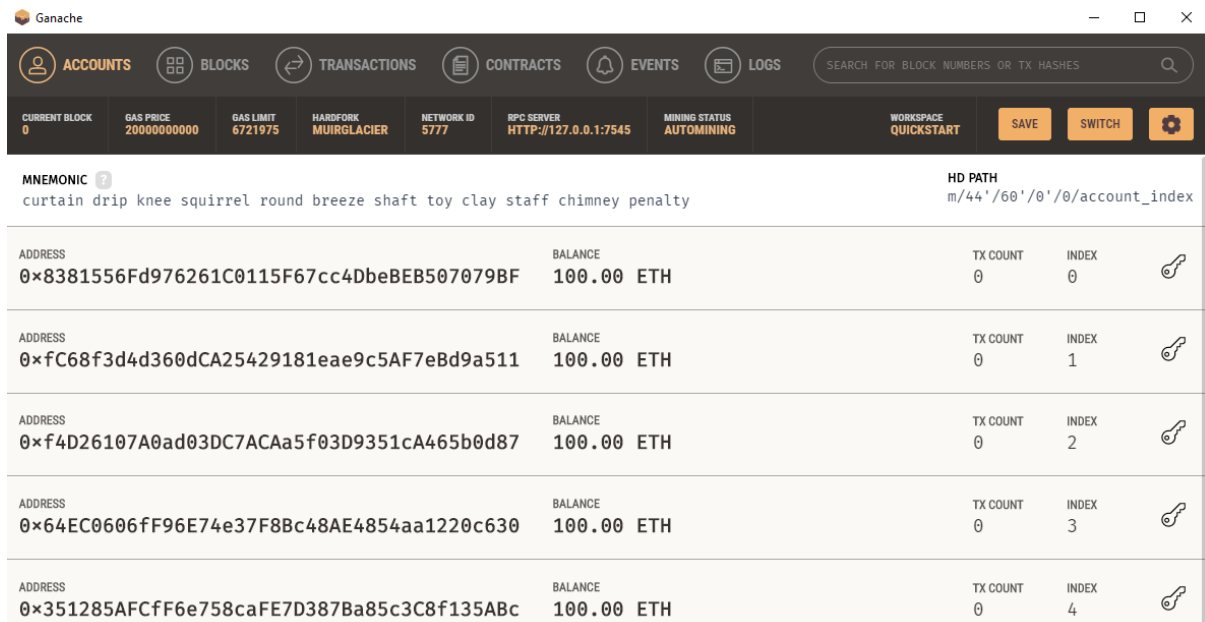
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## Using Ganache

After installing, I am now able to launch Ganache.



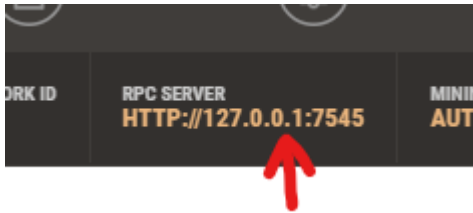
Click on the “Quickstart” button, and you will see the following:



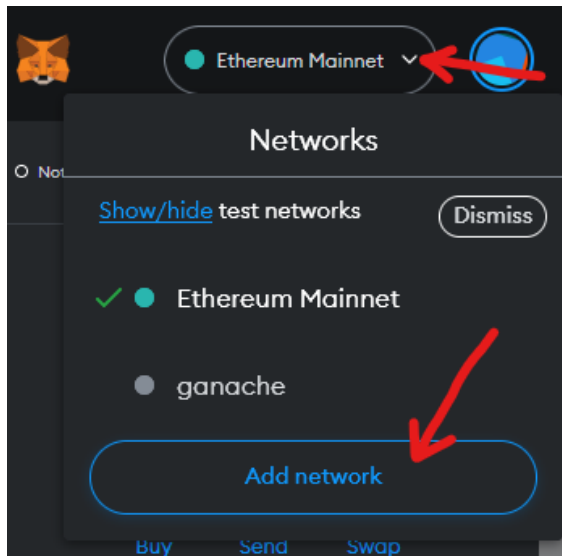
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## Adding local network to MetaMask

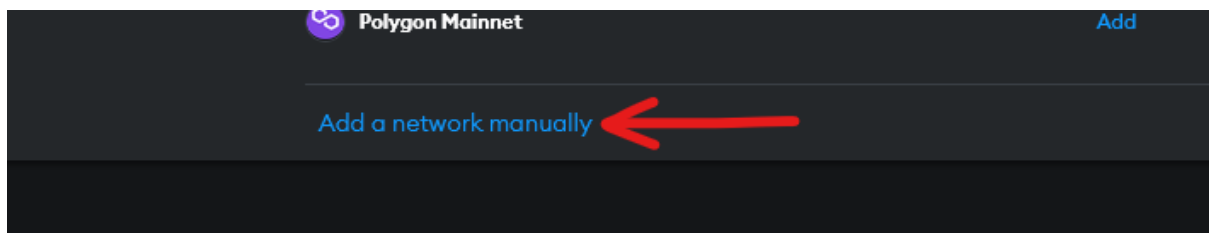
Now, copy the RPC URL.



Go to MetaMask and click on the following:



This is to add the local blockchain network into MetaMask. Scroll all the way down, and click on "Add a network manually".



Finally, fill in the following fields:

- Network name
- New RPC URL
- Chain ID
- Currency symbol

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**i** 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** **i**

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

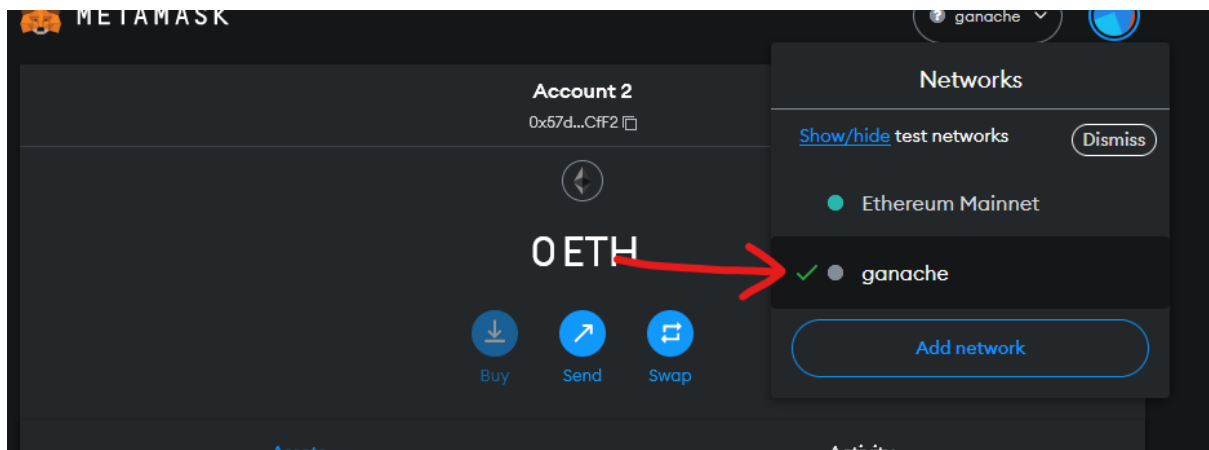
**Currency symbol**

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

**Block explorer URL** (Optional)

Click on the “Save” button.

The network is now added to MetaMask.



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## Importing a Ganache account into MetaMask

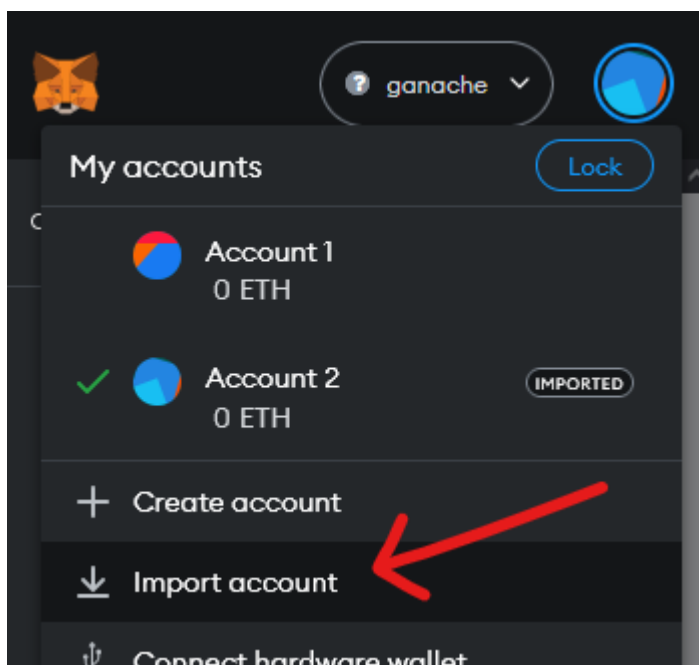
We need to import a local account in Ganache, to MetaMask. To do so, go back to Ganache and click on the little key icon of any account.



Now, copy the private key.

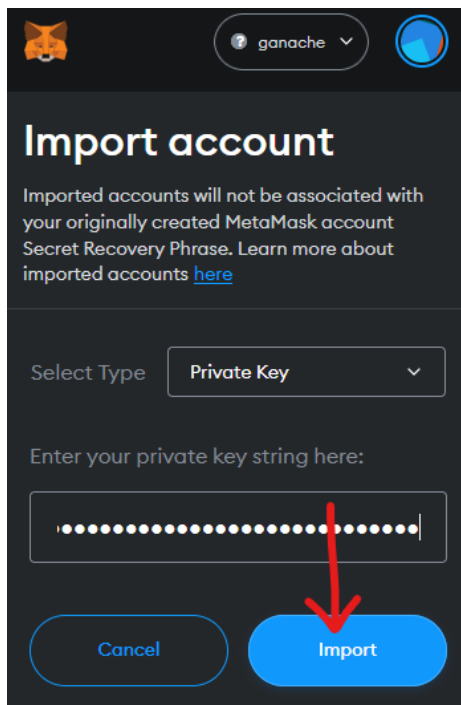


Go back to MetaMask, click on your profile picture, and then, click on the “Import account” button.

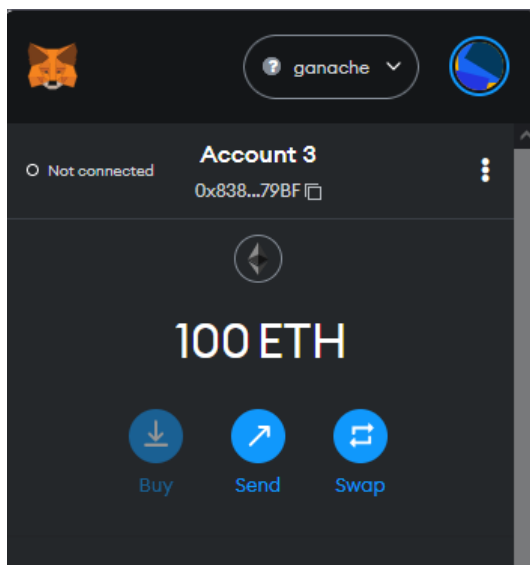


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Then, paste the private key you copied and click on the “Import” button.



The balance is now visible in my MetaMask wallet, meaning that the import was successful.



The next step is to create smart contracts.

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## Creating a smart contract

To create a smart contract, I first created a new separate folder. Here, I ran the following commands in order:

```
truffle init
```

```
truffle create contract Kshitij
```

```
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain>cd truffle
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>truffle init
Starting init...
=====
> Copying project files to C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle
Init successful, sweet!

Try our scaffold commands to get started:
$ truffle create contract YourContractName # scaffold a contract
$ truffle create test YourTestName        # scaffold a test

http://trufflesuite.com/docs

C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>truffle create contract Kshitij
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>ls
contracts migrations test truffle-config.js
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>ls contracts
Kshitij.sol
```

I opened the “Kshitij.sol” file and added the following code to it:

```
pragma solidity >=0.4.22 <0.9.0;
```

```
contract Kshitij {
    uint256 public counter = 0;

    constructor() public {
        incrementCounter();
    }

    function incrementCounter() public {
        counter++;
    }
}
```

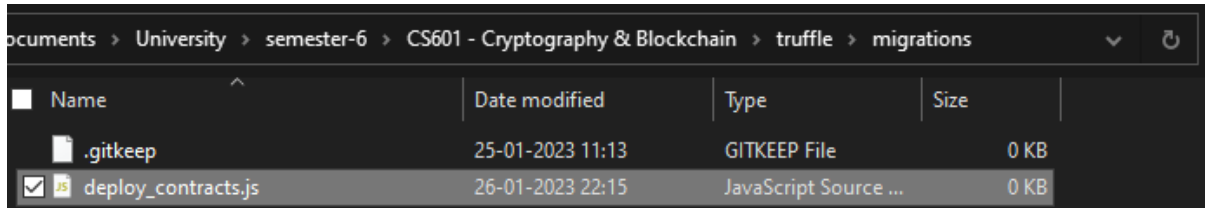
The next step is to make a piece of JavaScript code that will allow deploying the smart contract.



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## JavaScript snippet to deploy the contract

In the “migrations” folder, I created a new file called “deploy\_contracts.js”.



In this file, I added the following piece of code:

```
module.exports = function (deployer) {  
  deployer.deploy(artifacts.require("./Kshitij.sol"));  
};
```

## Compiling and deploying the contract

Go back to CMD and type the following command:

`truffle compile`

```
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>truffle compile  
  
Compiling your contracts...  
=====
```

	Warning: Visibility for constructor is ignored. If you want the contract to be non-deployable, making it "abstract" is sufficient.
> Compiling .\contracts\Kshitij.sol	solc-bin. Attempt #1
> Compilation warnings encountered:	
	Warning: Visibility for constructor is ignored. If you want the contract to be non-deployable, making it "abstract" is sufficient.
--> project:/contracts/Kshitij.sol:7:3:	
7	
7   constructor() public {	
^	(Relevant source part starts here and spans across multiple lines).

```
> Artifacts written to C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle\build\contracts  
> Compiled successfully using:  
- solc: 0.8.17+commit.8df45f5f.Emscripten.clang  
- Fetching solc version list from solc-bin. Attempt #1  
C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>
```

To deploy, type the following command:

`truffle migrate`

```
Starting migrations...  
=====
```

	Network name:	'ganache'
> Network id:	5777	
> Block gas limit:	6721975	(0x6691b7)

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

	Deploying 'Kshitij'
> transaction hash:	0x380100fbc12131955b650ae2e5a6432fdb3c193a4e8dee5a60548b0f692ea79
> Blocks:	0
> Seconds:	0
> contract address:	0x588A3255A5fa262D510d3fd750C862e75eDh302b

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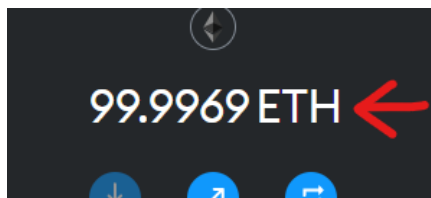
```
> Blocks: 0          Seconds: 0
> contract address:  0x588A3255AFfa262D519d3fd7E9C862e75eDb303b
> block number:      1
> block timestamp:    1674752005
> account:           0x8381556Fd976261C0115F67cc4DbeBEB507079BF
> balance:           99.99692724
> gas used:           153638 (0x25826)
> gas price:          20 gwei
> value sent:         0 ETH
> total cost:         0.00307276 ETH

> Saving artifacts
-----
> Total cost:         0.00307276 ETH

Summary
=====
> Total deployments:  1
> Final cost:         0.00307276 ETH

C:\Users\kshit\Documents\University\semester-6\CS601 - Cryptography & Blockchain\truffle>
```

After a transaction, we can see that the Ether is now reduced:



On Ganache, if we go to the “Blocks” tab, we can see the block along with the amount of gas that was used.

BLOCK	MINED ON	GAS USED	TRANSACTIONS
1	2023-01-26 22:23:25	153638	1 TRANSACTION
0	2023-01-26 21:50:51	0	NO TRANSACTIONS

BLOCK 1			
GAS USED	GAS LIMIT	MINED ON	BLOCK HASH
153638	6721975	2023-01-26 22:23:25	0x7a11f2c2a0205040464028bd9a30fb7223f3a2d550a53271cca7b51699f29d4e

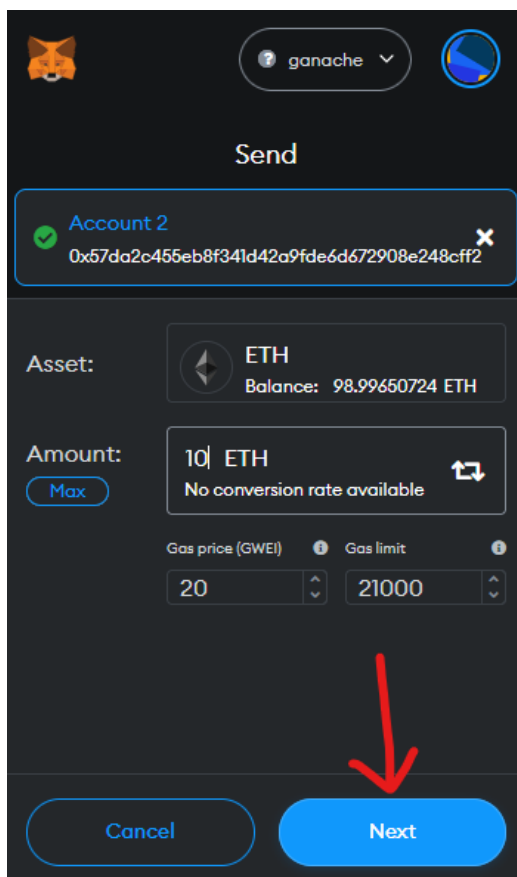
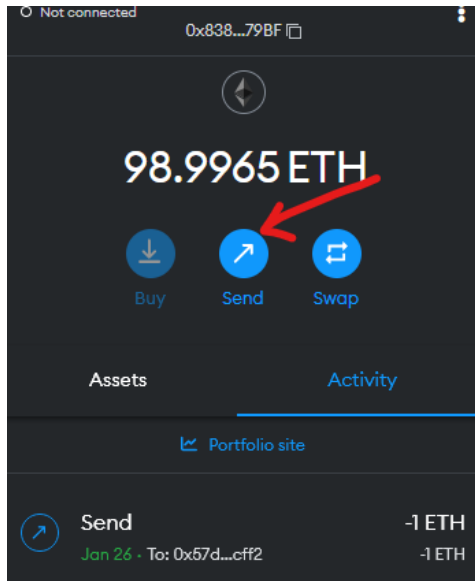
  

TX HASH		CONTRACT CREATION	
0x380100fbc12131955b650ae2e5a6432fdb3c193a4e8dee5a60548b0f692ea79			
FROM ADDRESS	CREATED CONTRACT ADDRESS	GAS USED	VALUE
0x8381556Fd976261C0115F67cc4DbeBEB507079BF	0x588A3255AFfa262D519d3fd7E9C862e75eDb303b	153638	0

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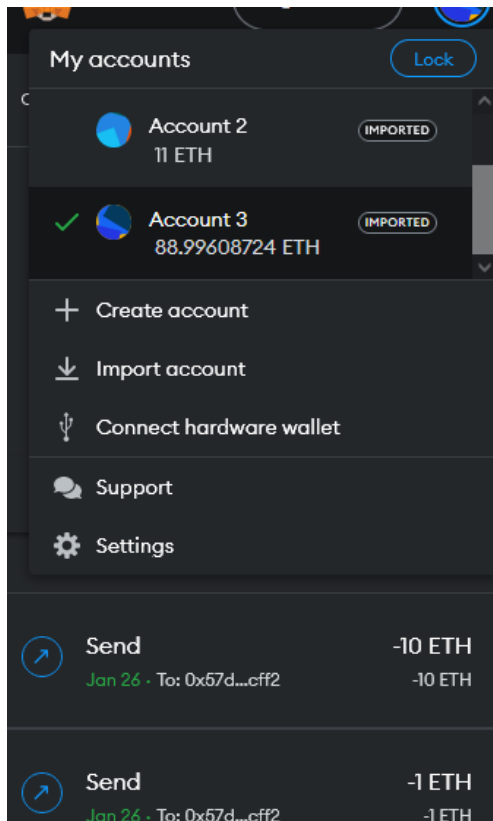
## Sending ether to another imported account

I can try sending some money from one local account to the other.



After I click on “Next” button and the “Confirm” button, 10 ethers will be deducted from my account and sent to another account.

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And if I go back to Ganache, I can see that a block for the latest transaction has been added:

CURRENT BLOCK3

GAS PRICE20000000000

GAS LIMIT6721975

HARDFORKMUIRGLACIER

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

MINING STATUSAUTOMINING

WORKSPACEQUICKSTART

SAVE

SWITCH

BLOCK3

MINED ON2023-01-26 22:33:33

GAS USED21000

1 TRANSACTION

BLOCK2

MINED ON2023-01-26 22:30:10

GAS USED21000

1 TRANSACTION

← BACK

BLOCK 3

GAS USED21000

GAS LIMIT6721975

MINED ON2023-01-26 22:33:33

BLOCK HASH0x1b2c219031f8b4814f920755543751310ebe83861bf7d719ffdfdbbfb5f99900

TX HASH0xb763d0e280be5dec7329960e75444200f310a9c26562f207252bc554b092d05e

CONTRACT CALL

FROM ADDRESS0x8381556Fd976261C0115F67cc4Dbe8EB507079BF

TO CONTRACT ADDRESS0x57da2C455EB8F341d42A9FdE6D672908e248Cff2

GAS USED21000

VALUE10000000000000000000