Homework1

Programming a Faucet contract on the Sepolia testnet using Remix

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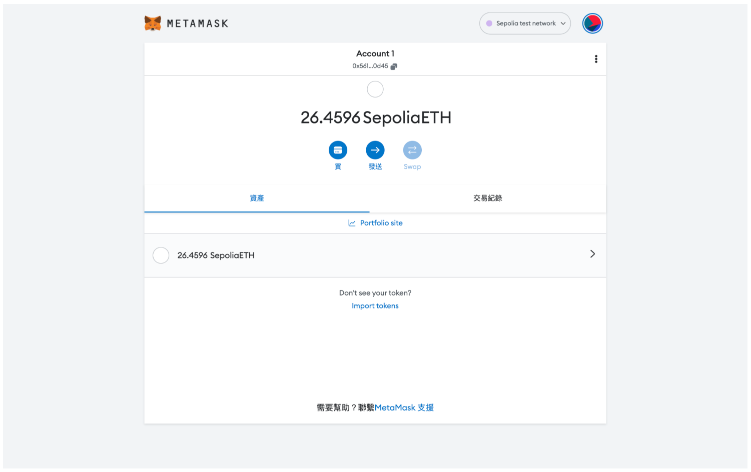
General sending and withdrawing Money

Introduction: We will show the process of sending and withdrawing between the wallet (0x5616d8...794f0d45) and the smart contract(0x2Dc571...31aF1052).Our source code on GitHub.

<step 1> metamask

We make a wallet (0x5616d8...794f0d45) and we get test coins from the Sepolia PoW Faucet.



26.4596 SepoliaETH

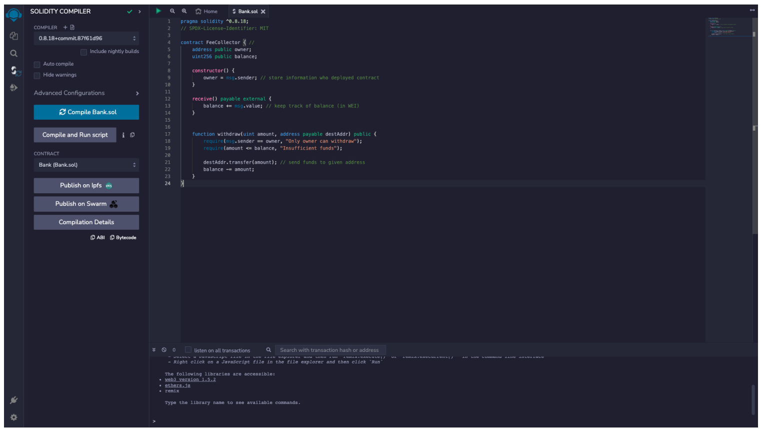
26.4596 SepoliaETH

Don't see your token?

需要幫助？聯繫MetaMask 支援

<step 2> Remix

Compiler original.sol on remix



COMPILER: 0.8.18+commit.87f61d96

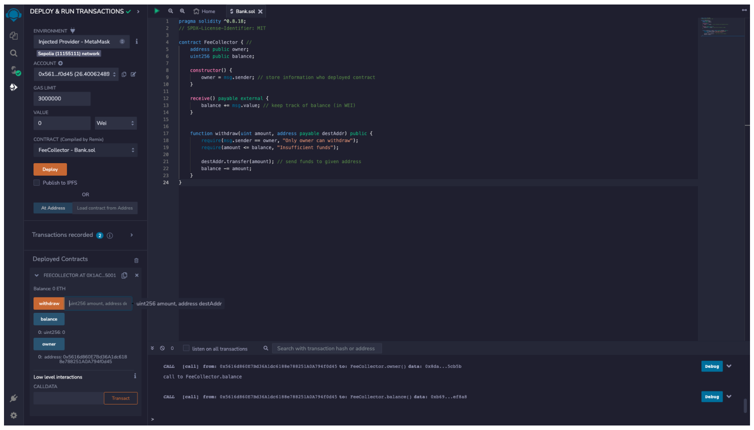
CONTRACT: Bank (Bank.sol)

```
pragma solidity ^0.8.18;
// SPDX-License-Identifier: MIT

contract FeeCollector { //
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }


    function withdraw(uint amount, address payable destAddr) public {
        require(msg.sender == owner, "Only owner can withdraw");
        require(amount <= balance, "Insufficient funds");

        destAddr.transfer(amount); // send funds to given address
        balance -= amount;
    }
}
```

```
  - Right click on a JavaScript file in the file explorer and then click `Run`

 The following libraries are accessible:
 • web3 version 1.5.2
 • ethers.js
 • remix

 Type the library name to see available commands.

>
```

<step 3> Link to our wallet

ENVIRONMENT chooses Injected Provider - MetaMask, and links its own matamask



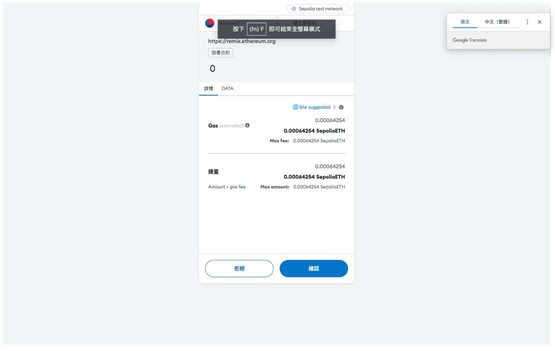
ENVIRONMENT: Injected Provider - MetaMask
Sepolia (11155111) network
ACCOUNT: 0x561...f0d45 (26.40062489
GAS LIMIT: 3000000
VALUE: 0 Wei
CONTRACT (Compiled by Remix): FeeCollector - Bank.sol
Publish to IPFS
FEECOLLECTOR AT 0X1AC...5001
Balance: 0 ETH
uint256 amount, address destAddr
0: uint256: 0
0: address: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
CALLDATA

```
pragma solidity ^0.8.18;
// SPDX-License-Identifier: MIT

contract FeeCollector { //
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }


    function withdraw(uint amount, address payable destAddr) public {
        require(msg.sender == owner, "Only owner can withdraw");
        require(amount <= balance, "Insufficient funds");

        destAddr.transfer(amount); // send funds to given address
        balance -= amount;
    }
}
```

```
CALL  [call]  from: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45 to: FeeCollector.owner() data: 0x8da...5cb5b
call to FeeCollector.balance

CALL  [call]  from: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45 to: FeeCollector.balance() data: 0xb69...ef8a8
```

<step 4> Make a smart contract

After pressing deploy, you will need to pay some gas, and the money in my wallet (0x5616d8...794f0d45) will decrease.

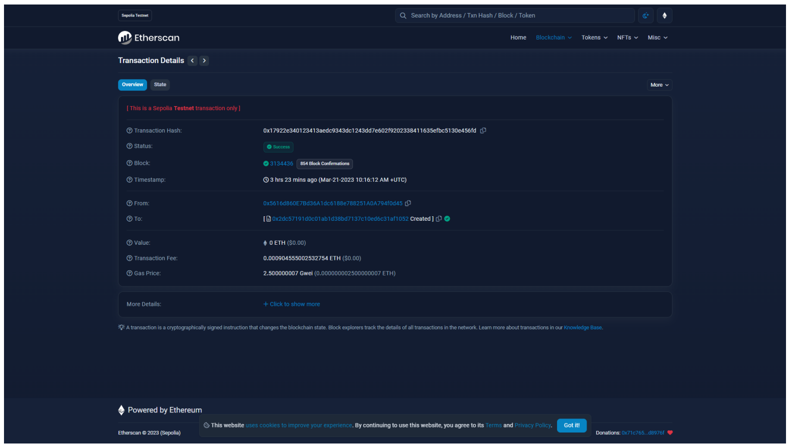


https://remix.ethereum.org
部署合約
0

Gas (estimated) 0.00064254
0.00064254 SepoliaETH
Max fee: 0.00064254 SepoliaETH

總量 0.00064254
0.00064254 SepoliaETH
Amount + gas fee Max amount: 0.00064254 SepoliaETH

Transaction Details from etherscan



[This is a Sepolia Testnet transaction only]

Transaction Hash: 0x17922e340123413aedc9343dc1243dd7e602f9202338411635efbc5130e456fd
Status: Success
Block: 3134436 854 Block Confirmations
Timestamp: 3 hrs 23 mins ago (Mar-21-2023 10:16:12 AM +UTC)

From: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
To: [0x2dc57191d0c01ab1d38bd7137c10ed6c31af1052 Created]

Value: 0 ETH ($0.00)
Transaction Fee: 0.000904555002532754 ETH ($0.00)
Gas Price: 2.500000007 Gwei (0.000000002500000007 ETH)

More Details: + Click to show more

A transaction is a cryptographically signed instruction that changes the blockchain state. Block explorers track the details of all transactions in the network. Learn more about transactions in our Knowledge Base.

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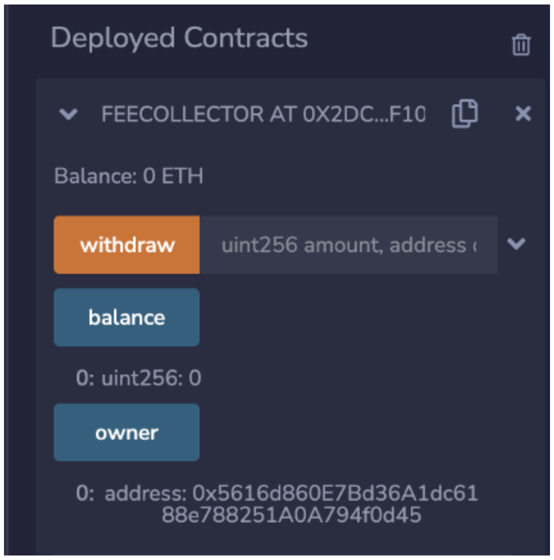
Donations: 0x71c765...d8976f

<step 5>The details of the smart contract

About Our new smart contract (0x2Dc571...31aF1052), we can check who the owner is and how much money is in the smart contract.



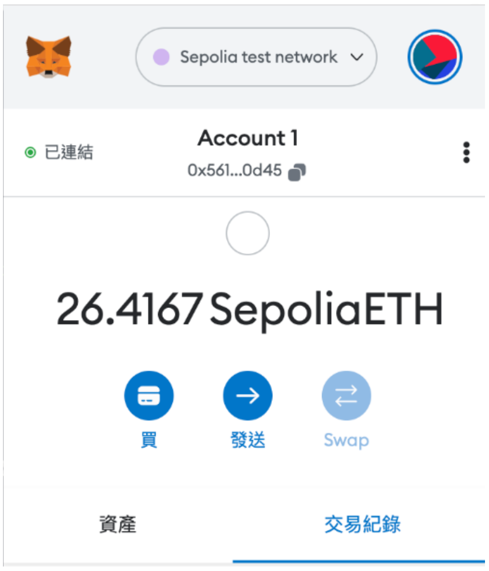
Balance: 0 ETH

0: uint256: 0

0: address: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45

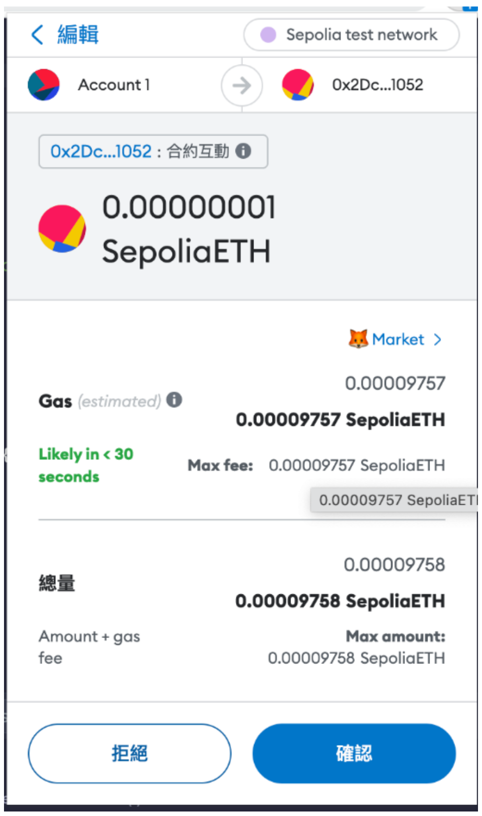
<step 6>Sending

Send money from my wallet (0x5616d8...794f0d45) to the smart contract (0x2Dc571...31aF1052)



26.4167 SepoliaETH

The details of the transaction: Amount+gas free = 0.00009757+0.00000001 = 0.00009758



< 編輯 Sepolia test network

Account 1 → 0x2Dc...1052

0x2Dc...1052 : 合約互動

0.00000001 SepoliaETH

Market >

Gas (estimated) 0.00009757

0.00009757 SepoliaETH

Likely in < 30 seconds

Max fee: 0.00009757 SepoliaETH

0.00009757 SepoliaET

總量 0.00009758

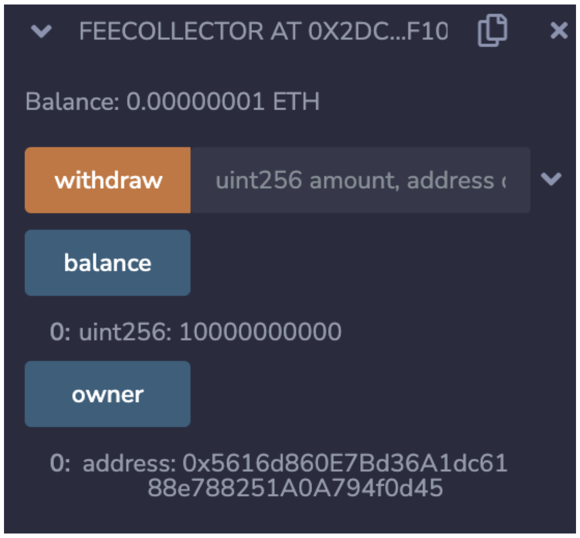
0.00009758 SepoliaETH

Amount + gas fee

Max amount: 0.00009758 SepoliaETH

拒絕 確認

Confirm that the smart contract has 0.00000001 ETH



FEECOLLECTOR AT 0X2DC...F10

Balance: 0.00000001 ETH

withdraw uint256 amount, address

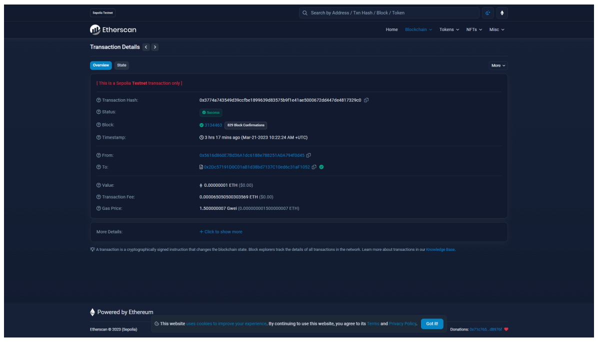
balance

0: uint256: 10000000000

owner

0: address: 0x5616d860E7Bd36A1dc61
88e788251A0A794f0d45

Transaction Details from etherscan


Sepolia Testnet

Search by Address / Txn Hash / Block / Token

Etherscan

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Transaction Details

Overview | State | More

[This is a Sepolia Testnet transaction only]

Transaction Hash:	0x3774a743549d39ccfbe1899639d83575b9f1e41ae5000672dd447de4817329c0
Status:	Success
Block:	3134463 829 Block Confirmations
Timestamp:	3 hrs 17 mins ago (Mar-21-2023 10:22:24 AM +UTC)
From:	0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
To:	0x2Dc57191D0C01aB1d38bd7137C10ed6c31aF1052
Value:	0.00000001 ETH ($0.00)
Transaction Fee:	0.000065050500303569 ETH ($0.00)
Gas Price:	1.500000007 Gwei (0.000000001500000007 ETH)
More Details:	+ Click to show more

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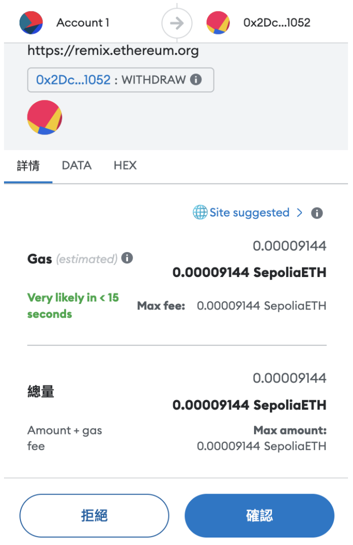
Donations: 0x71c765...d8976f

<step 9>Widrawing

After pressing the transaction in withdraw, the gas fee will be charged, and the money will be withdrawn


Account 1 → 0x2Dc...1052

https://remix.ethereum.org

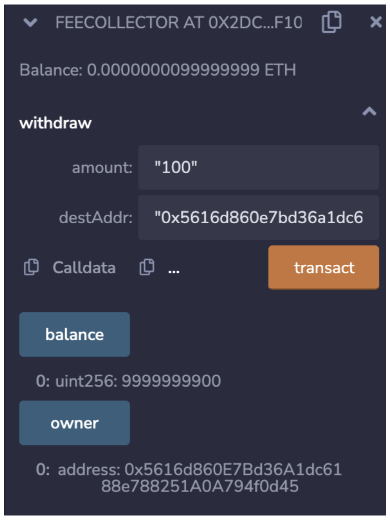
0x2Dc...1052 : WITHDRAW

詳情 | DATA | HEX

Site suggested

Gas (estimated)	0.00009144 **0.00009144 SepoliaETH**
Very likely in < 15 seconds	**Max fee:** 0.00009144 SepoliaETH
總量	0.00009144 **0.00009144 SepoliaETH**
Amount + gas fee	**Max amount:** 0.00009144 SepoliaETH

拒絕 | 確認


FEECOLLECTOR AT 0X2DC...F10

Balance: 0.0000000099999999 ETH

withdraw

amount: "100"

destAddr: "0x5616d860e7bd36a1dc6

Calldata ... transact

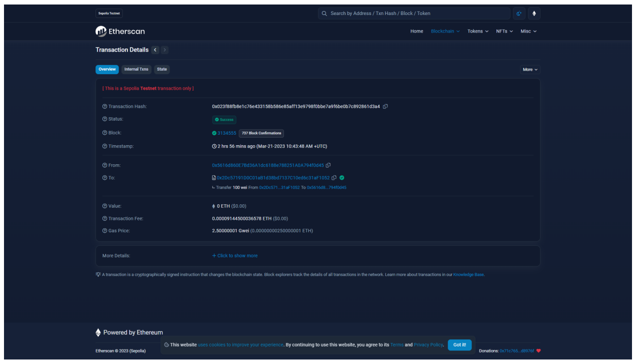
balance

0: uint256: 9999999900

owner

0: address: 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45

Transaction Details from etherscan


Sepolia Testnet

Search by Address / Txn Hash / Block / Token

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Transaction Details

Overview | Internal Txns | State | More

[This is a Sepolia Testnet transaction only]

Transaction Hash:	0x023f88fb8e1c76e433158b586e85aff13e9798f0bbe7a9f6be0b7c892861d3a4
Status:	Success
Block:	3134555 737 Block Confirmations
Timestamp:	2 hrs 56 mins ago (Mar-21-2023 10:43:48 AM +UTC)
From:	0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
To:	0x2Dc57191D0C01aB1d38bd7137C10ed6c31aF1052 └ Transfer 100 wei From 0x2Dc571...31aF1052 To 0x5616d8...794f0d45
Value:	0 ETH ($0.00)
Transaction Fee:	0.00009144500036578 ETH ($0.00)
Gas Price:	2.50000001 Gwei (0.00000000250000001 ETH)
More Details:	+ Click to show more

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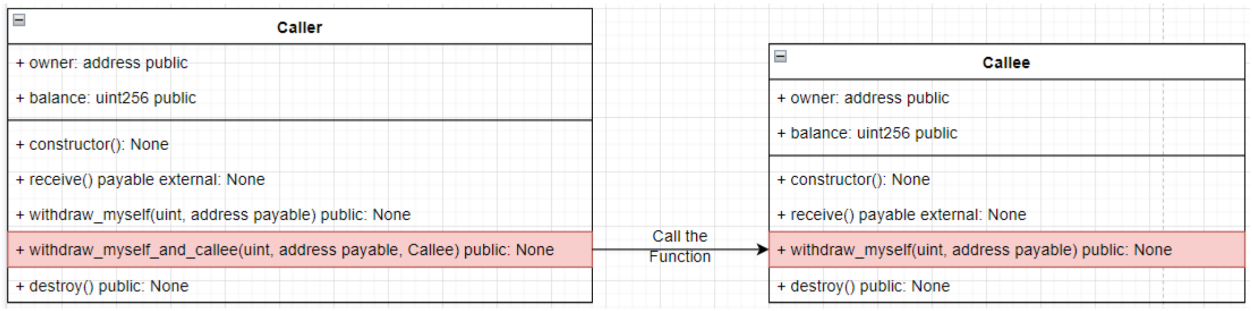
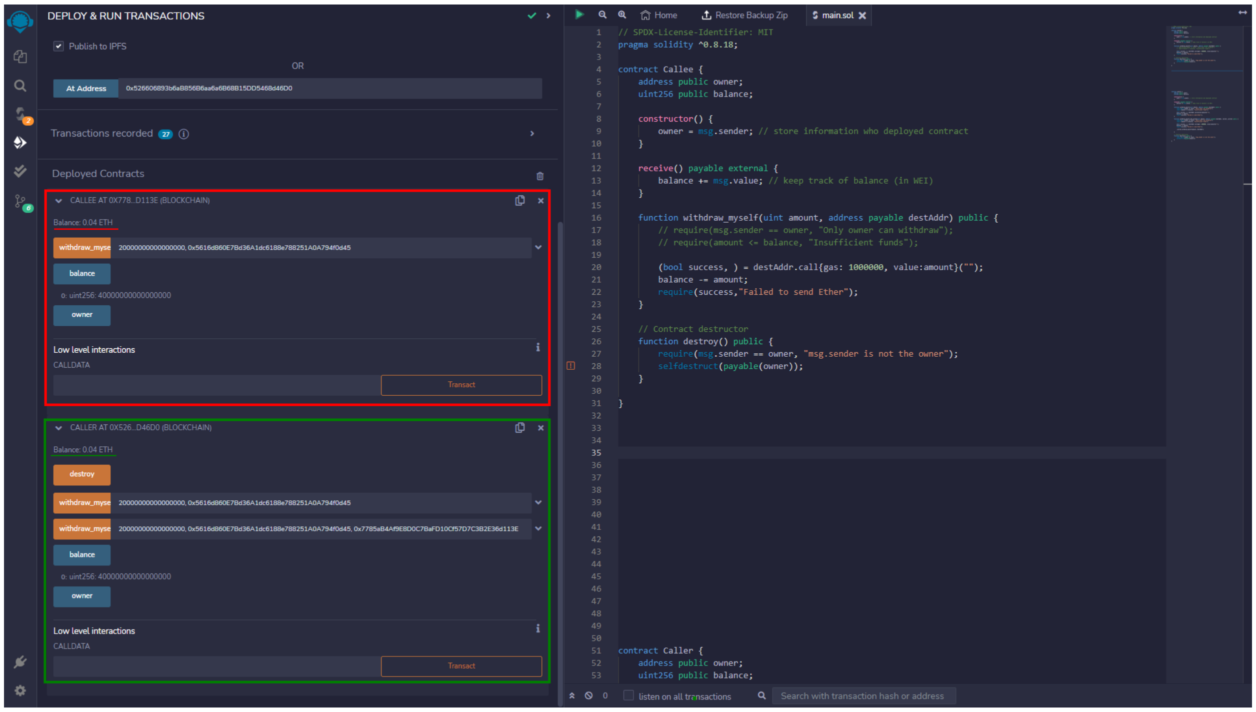
Donations: 0x71c765...d8976f

Call Other Contracts

Introduction: we want to try to check the problem: Who pays gas when a contract function that creates/calls another contract is called? In the Below diagram, we design two smart contracts Caller and callee. The function withdraw_myself of both smart contracts can withdraw money from the smart contract to our wallet. The Caller's withdraw_myself_and_callee of can ont only withdraw money, but call the Callee's function withdraw_myself. Our source code on GitHub.


Caller
+ owner: address public
+ balance: uint256 public
+ constructor(): None
+ receive() payable external: None
+ withdraw_myself(uint, address payable) public: None
+ withdraw_myself_and_callee(uint, address payable, Callee) public: None
+ destroy() public: None
Call the Function
Callee
+ owner: address public
+ balance: uint256 public
+ constructor(): None
+ receive() payable external: None
+ withdraw_myself(uint, address payable) public: None
+ destroy() public: None

<step 1>Check the wallet and smart contracts: We have a wallet (0x5616d8...794f0d45) and two smart contracts callee (0x7785aB...E36d113E) and caller (0x526606...468d46D0) with a balance 0.04 ETH.



0x526606893b6aB856B6aa6a6B68B15DD5468d46D0

CALLEE AT 0X778...D113E (BLOCKCHAIN)

Balance: 0.04 ETH

withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45

balance

0: uint256: 40000000000000000

owner

Low level interactions

CALLDATA

Transact

CALLER AT 0X526...D46D0 (BLOCKCHAIN)

Balance: 0.04 ETH

destroy

withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45

withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45, 0x7785aB4Af9E8D0C7BaFD10Cf57D7C3B2E36d113E

balance

0: uint256: 40000000000000000

owner

Low level interactions

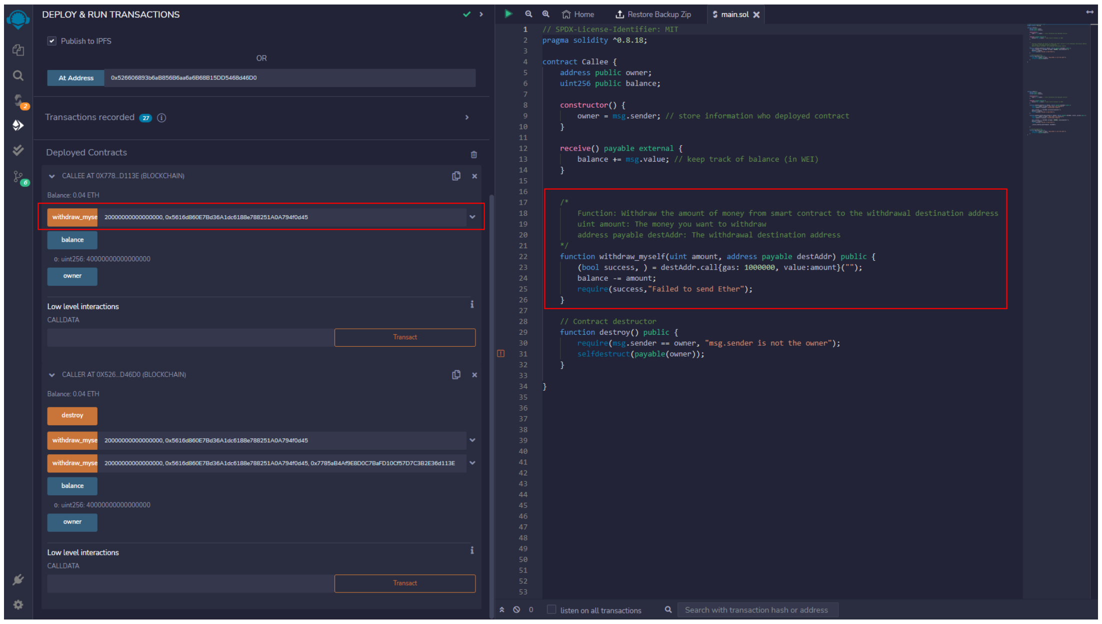
CALLDATA

Transact

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.18;

contract Callee {
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }

    function withdraw_myself(uint amount, address payable destAddr) public {
        // require(msg.sender == owner, "Only owner can withdraw");
        // require(amount <= balance, "Insufficient funds");

        (bool success, ) = destAddr.call{gas: 1000000, value:amount}("");
        balance -= amount;
        require(success,"Failed to send Ether");
    }

    // Contract destructor
    function destroy() public {
        require(msg.sender == owner, "msg.sender is not the owner");
        selfdestruct(payable(owner));
    }

}



















contract Caller {
    address public owner;
    uint256 public balance;
```

0
listen on all transactions
Search with transaction hash or address

<step 2> General Transfer money (Transaction Details): We call the function withdraw_myself to withdraw the amount of money from smart contract callee (0x7785aB...E36d113E) to my wallet (0x5616d8...794f0d45).
Transfer 0.02 ETH From 0x7785aB...E36d113E(callee) To 0x5616d8...794f0d45 (wallet)
Transaction Fee: 0.000086507500276824 ETH = 86507.500276824 Gwei



0x526606893b6aB856B6aa6a6B68B15DD5468d46D0

Transactions recorded 27

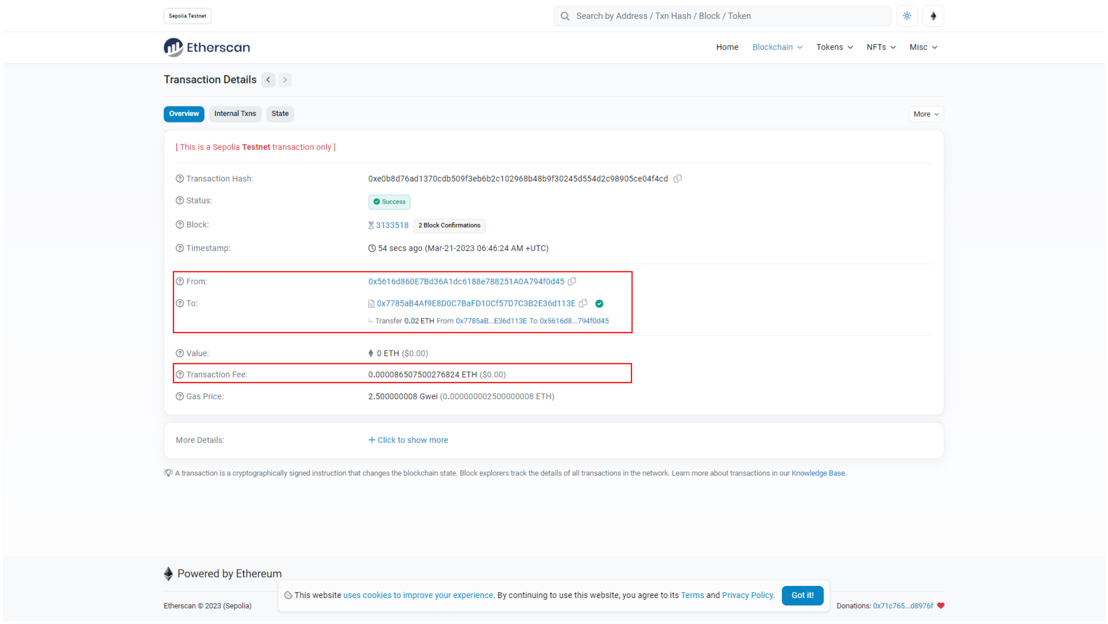
Deployed Contracts

CALLEE AT 0X778...D113E (BLOCKCHAIN)
Balance: 0.04 ETH
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
balance
0: uint256: 40000000000000000
owner
Low level interactions
CALLDATA
Transact

CALLER AT 0X526...D46D0 (BLOCKCHAIN)
Balance: 0.04 ETH
destroy
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45, 0x7785aB4Af9E8D0C7BaFD10Cf57D7C3B2E36d113E
balance
0: uint256: 40000000000000000
owner
Low level interactions
CALLDATA
Transact

listen on all transactions
Search with transaction hash or address

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.18;

contract Callee {
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }


    /*
        Function: Withdraw the amount of money from smart contract to the withdrawal destination address
        uint amount: The money you want to withdraw
        address payable destAddr: The withdrawal destination address
    */
    function withdraw_myself(uint amount, address payable destAddr) public {
        (bool success, ) = destAddr.call{gas: 1000000, value:amount}("");
        balance -= amount;
        require(success,"Failed to send Ether");
    }

    // Contract destructor
    function destroy() public {
        require(msg.sender == owner, "msg.sender is not the owner");
        selfdestruct(payable(owner));
    }

}
```



Transaction Details

[This is a Sepolia **Testnet** transaction only]

Transaction Hash:	0xe0b8d76ad1370cdb509f3eb6b2c102968b48b9f30245d554d2c98905ce04f4cd
Status:	Success
Block:	3133518 2 Block Confirmations
Timestamp:	54 secs ago (Mar-21-2023 06:46:24 AM +UTC)
From:	0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
To:	0x7785aB4Af9E8D0C7BaFD10Cf57D7C3B2E36d113E └ Transfer 0.02 ETH From 0x7785aB...E36d113E To 0x5616d8...794f0d45
Value:	0 ETH ($0.00)
Transaction Fee:	0.000086507500276824 ETH ($0.00)
Gas Price:	2.500000008 Gwei (0.000000002500000008 ETH)
More Details:	+ Click to show more

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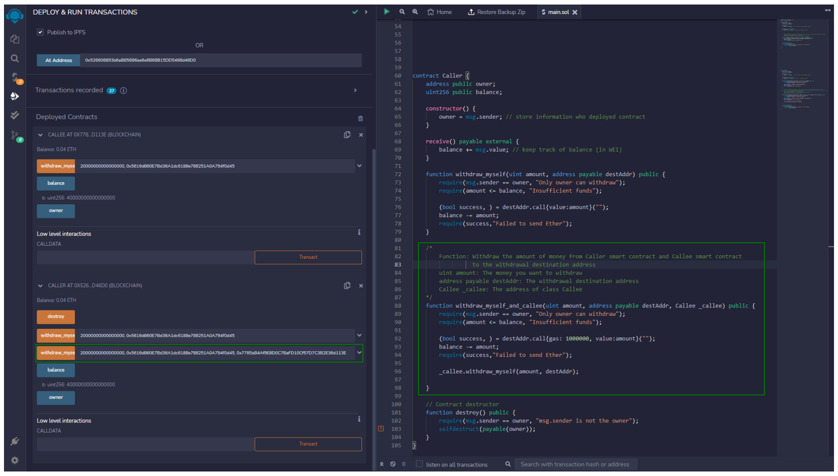
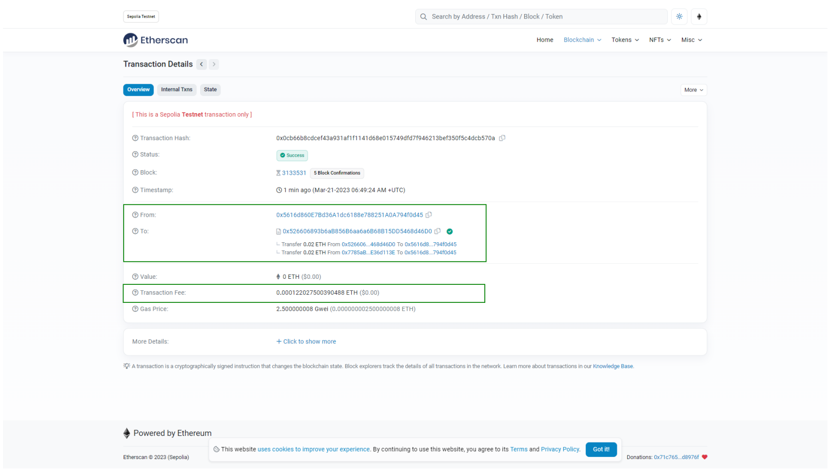
Donations: 0x71c765...d8976f

<step 3> Transfer money two times(Transaction Details): a contract function that creates/calls another contract is called.
Transfer 0.02 ETH From 0x526606...468d46D0 (caller) To 0x5616d8...794f0d45 (wallet)
Transfer 0.02 ETH From 0x7785aB...E36d113E (callee)To 0x5616d8...794f0d45 (wallet)
Transaction Fee: 0.000122027500390488 ETH = 122027.500390488 Gwei



```
At Address 0x526606893b6aB856B6aa6a6B68B15DD5468d46D0

CALLEE AT 0X778...D113E (BLOCKCHAIN)
Balance: 0.04 ETH
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
balance
0: uint256: 40000000000000000

CALLER AT 0X526...D46D0 (BLOCKCHAIN)
Balance: 0.04 ETH
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
withdraw_myse 20000000000000000, 0x5616d860E7Bd36A1dc6188e788251A0A794f0d45, 0x7785aB4Af9E8D0C7BaFD10Cf57D7C3B2E36d113E
balance
0: uint256: 40000000000000000
```

```
contract Caller {
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }

    function withdraw_myself(uint amount, address payable destAddr) public {
        require(msg.sender == owner, "Only owner can withdraw");
        require(amount <= balance, "Insufficient funds");

        (bool success, ) = destAddr.call{value:amount}("");
        balance -= amount;
        require(success,"Failed to send Ether");
    }

    /*
        Function: Withdraw the amount of money from Caller smart contract and Callee smart contract
                    to the withdrawal destination address
        uint amount: The money you want to withdraw
        address payable destAddr: The withdrawal destination address
        Callee _callee: The address of class Callee
    */
    function withdraw_myself_and_callee(uint amount, address payable destAddr, Callee _callee) public {
        require(msg.sender == owner, "Only owner can withdraw");
        require(amount <= balance, "Insufficient funds");

        (bool success, ) = destAddr.call{gas: 1000000, value:amount}("");
        balance -= amount;
        require(success,"Failed to send Ether");

        _callee.withdraw_myself(amount, destAddr);

    }

    // Contract destructor
    function destroy() public {
        require(msg.sender == owner, "msg.sender is not the owner");
        selfdestruct(payable(owner));
    }
}
```



Transaction Details

[This is a Sepolia **Testnet** transaction only]

Transaction Hash:	0x0cb66b8cdcef43a931af1f1141d68e015749dfd7f946213bef350f5c4dcb570a
Status:	Success
Block:	3133531 5 Block Confirmations
Timestamp:	1 min ago (Mar-21-2023 06:49:24 AM +UTC)
From:	0x5616d860E7Bd36A1dc6188e788251A0A794f0d45
To:	0x526606893b6aB856B6aa6a6B68B15DD5468d46D0 └ Transfer 0.02 ETH From 0x526606...468d46D0 To 0x5616d8...794f0d45 └ Transfer 0.02 ETH From 0x7785aB...E36d113E To 0x5616d8...794f0d45
Value:	0 ETH ($0.00)
Transaction Fee:	0.000122027500390488 ETH ($0.00)
Gas Price:	2.500000008 Gwei (0.000000002500000008 ETH)
More Details:	+ Click to show more

A transaction is a cryptographically signed instruction that changes the blockchain state. Block explorers track the details of all transactions in the network. Learn more about transactions in our Knowledge Base.

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Donations: 0x71c765...d8976f

Conclusion:
On step 3, we can find that our wallet has to pay the gas used by the smart contract caller and callee.

The problems we meet

a. Warning message:

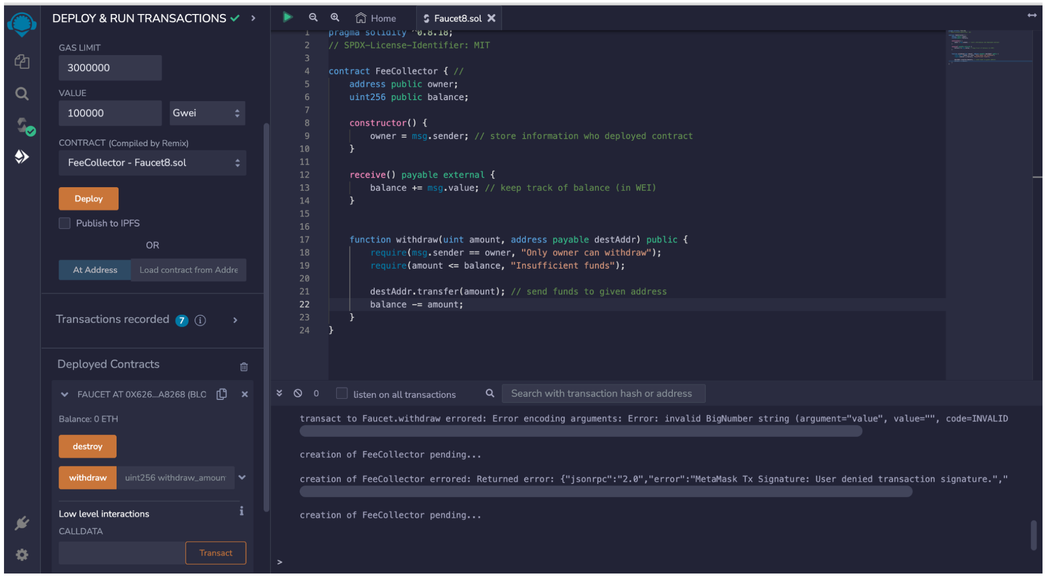
```
Warning: SPDX license identifier not provided in source file. Before publishing, consider adding a comment containing "SPDX-License-Identifier: <SPDX-License>" to each source file. Use "SPDX-License-Identifier: UNLICENSED" for non-open-source code. Please see https://spdx.org for more information.
```

can add the '// SPDX-License-Identifier: MIT' on the first line of code to fix the problem.

b. In the beginning, our previous version code have an error message:

```
Gas estimation errored with the following message (see below). The transaction execution will likely fail. Do you want to force sending?
```

The reason may be that the money will not be sent until the smart contract is deployed, so you must set this value to 0.



GAS LIMIT: 3000000

VALUE: 100000 Gwei

CONTRACT (Compiled by Remix): FeeCollector - Faucet8.sol

FAUCET AT 0X626...A8268 (BLC

Balance: 0 ETH

```
pragma solidity ^0.8.18;
// SPDX-License-Identifier: MIT

contract FeeCollector { //
    address public owner;
    uint256 public balance;

    constructor() {
        owner = msg.sender; // store information who deployed contract
    }

    receive() payable external {
        balance += msg.value; // keep track of balance (in WEI)
    }


    function withdraw(uint amount, address payable destAddr) public {
        require(msg.sender == owner, "Only owner can withdraw");
        require(amount <= balance, "Insufficient funds");

        destAddr.transfer(amount); // send funds to given address
        balance -= amount;
    }
}
```

```
transact to Faucet.withdraw errored: Error encoding arguments: Error: invalid BigNumber string (argument="value", value="", code=INVALID

creation of FeeCollector pending...

creation of FeeCollector errored: Returned error: {"jsonrpc":"2.0","error":"MetaMask Tx Signature: User denied transaction signature.","

creation of FeeCollector pending...

>
```

So we replaced a new version of original.sol.