

Medical Record

选题背景

当前社会上每个人基本上都有多个病历本，分别由不同的医院掌握，当我们去看病时，医院可能没有或没有完全掌握我们的病史情况和医疗记录，这样就会给我们的就医造成很大的困扰，有时甚至会导致误诊，不能对症下药。

选题依据

如果能够利用区块链技术来保存我们的病历，就能保证我们每个人都只有一个病历本，并且由我们自己掌握，需要时再由用户授权给医院查询特定的病史和医疗记录，以及添加新的就医记录，同时限制医院不能更改已有的医疗记录。这样既能保护用户的隐私，又能保证病历的不可篡改性，还能使用户未来看病或对自己健康做规划时有数据可用。

实验步骤

环境搭建

1. 安装 Node (官网下载)
2. 安装 Truffle (`npm install -g truffle`)
3. 安装 web3 (`npm install web3`)
4. 安装 Ganache (官网下载)
5. 安装 lite-server (`npm install -g lite-server`)
6. 安装 MetaMask (浏览器扩展程序)

创建项目

truffle init 创建全新的项目

编写智能合约

在 contracts 目录下，添加合约文件 MedicalRecord.sol

编译智能合约

truffle compile

```
D:\Study\BlockChain\MedicalRecord>truffle compile
Compiling .\contracts\MedicalRecord.sol...
Compiling .\contracts\Migrations.sol...

Compilation warnings encountered:

/D/Study/BlockChain/MedicalRecord/contracts/MedicalRecord.sol:2:1:
pragma experimental ABIEncoderV2;
-----
Writing artifacts to .\build\contracts
```

部署智能合约

1. 在 migrations 文件夹下创建部署脚本 2_deploy_contracts.js

```
var MedicalRecord = artifacts.require("MedicalRecord");

module.exports = function(deployer) {
  deployer.deploy(MedicalRecord, "John", "1990.11.11", 1, "15627897895", "86 Brattle Street, Cambridge, MA 02138", "123@163.com");
};
```

2. 启动 Ganache 来开启一个私链进行开发测试

ACCOUNTS

BLOCKS

TRANSACTIONS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK 22	GAS PRICE 2000000000	GAS LIMIT 6721975	NETWORK ID 5777	RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING
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MNEMONIC

bamboo lunar try crop reason monitor spawn negative rather over calm glide

HD PATH

m/44'/60'/0'

ADDRESS 0x1D49F709cBdf561B4c317e1ce442E849CE0A9B39	BALANCE 99.93 ETH	TX COUNT 21
ADDRESS 0x7E0148D302C51B7F0f17168218337e5c8c765bc4	BALANCE 100.00 ETH	TX COUNT 1
ADDRESS 0xb147dfbc7800cB0154CbC9741b191aE1733aC5f4	BALANCE 100.00 ETH	TX COUNT 0
ADDRESS 0x3860C24ac7f6440602D96320d2905E16D99B1906	BALANCE 100.00 ETH	TX COUNT 0
ADDRESS 0xf5bb191c53bC6aF31Be562A362448f68f341eCcB	BALANCE 100.00 ETH	TX COUNT 0
ADDRESS 0xe346943b2493d2Bc2EeF93a7DE39a93DB8f94eca	BALANCE 100.00 ETH	TX COUNT 0

truffle migrate 执行部署命令

```
D:\Study\BlockChain\MedicalRecord>truffle migrate
⚠️ Important ⚠️
If you're using an HDWalletProvider, it must be Web3 1.0 enabled or your migration will hang.
Try: npm install --save truffle-hdwallet-provider@web3-one



Starting migrations...
=====
> Network name:      'ganache'
> Network id:       5777
> Block gas limit:  6721975

2_deploy_contracts.js
=====

Deploying 'MedicalRecord'
=====
> transaction hash:  0x0e830091f562a0213d0d7872bd0dcaf8a3dbfb7bb29087e5e5a67a2d4adca773
> Blocks: 0         Seconds: 0
> contract address: 0x439666cd8F5d7f87A6fBF59966EF8c789Bc31CBd
> account:          0x1D49F709cBdf561B4c317e1ce442E849CE0A9B39
> balance:          99.95060786
> gas used:         2142729
> gas price:        20 gwei
> value sent:       0 ETH
> total cost:       0.04285458 ETH

> Saving migration to chain.
> Saving artifacts
=====
> Total cost:       0.04285458 ETH

Summary
=====
> Total deployments: 1
> Final cost:       0.04285458 ETH
```

CURRENT BLOCK 4	GAS PRICE 2000000000	GAS LIMIT 6721975	NETWORK ID 5777	RPC SERVER HTTP://127.0.0.1:7545	MINING STATUS AUTOMINING	
Mnemonic  bamboo lunar try crop reason monitor spawn negative rather over calm glide						
ADDRESS 0x1D49F709cBDf561B4c317e1ce442E849CE0A9B39			BALANCE 99.95 ETH			

产生了四个区块说明部署成功

编辑 HTML 文件创建布局

Medical Record

Authorize doctors to operate medical records

Doctor's Address

Doctor's Name

Operation Times

Confirm

Add A New Medical Record

Disease Type

☒ Internal Medicine
☐ Surgery
☐ Ophthalmology and Otorhinolaryngology
☐ Psychiatric
☐ Dermatology
☐ Infectious Diseases
☐ Others

Disease Name

Disease Symptom

Disease Treatment

Date

Confirm

Get Medical Record

Disease Type

☒ Internal Medicine
☐ Surgery
☐ Ophthalmology and Otorhinolaryngology
☐ Psychiatric
☐ Dermatology
☐ Infectious Diseases
☐ Others

Confirm

Result

创建用户接口和智能合约交互

```

var account = web3.eth.getCoinbase();

App.contracts.MedicalRecord.deployed()
.then(function(instance){
    MedicalRecordInstance = instance;
    return MedicalRecordInstance.giveRightToOperate(address, name, times, {from: account});
}).then(function(result) {
    console.log(result);
}).catch(function(err) {
    alert(err.message);
});

var account = web3.eth.getCoinbase();

App.contracts.MedicalRecord.deployed()
.then(function(instance){
    MedicalRecordInstance = instance;
    return MedicalRecordInstance.addRecord(diseasetype, diseasename, diseasesymptom, diseasetreatment);
}).then(function(result) {
    console.log(result);
}).catch(function(err) {
    alert(err.message);
});

App.contracts.MedicalRecord.deployed()
.then(function(instance){
    MedicalRecordInstance = instance;
    return MedicalRecordInstance.getRecord(diseasetype, {from: account});
}).then(function(owner, ret) {
    console.log(ret);
}).catch(function(err) {
    alert(err.message);
});

```

运行测试

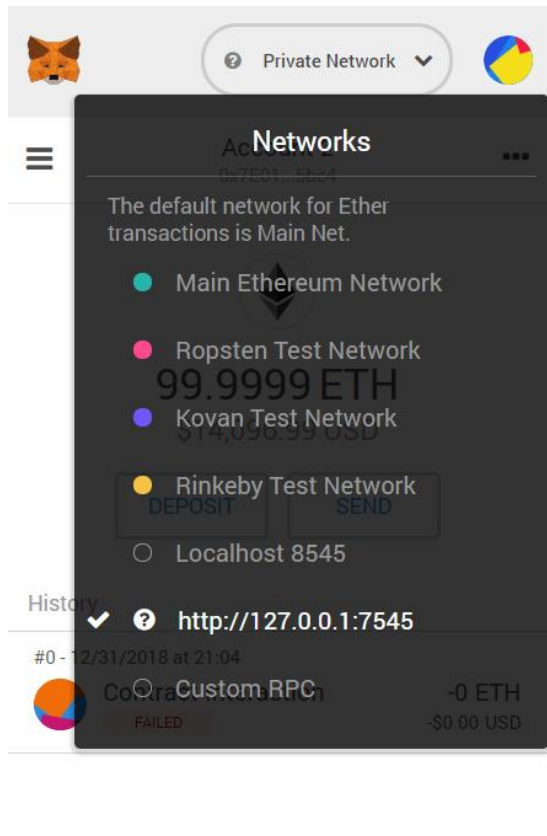
复制 Ganache 助记词

MNEMONIC ?

bamboo lunar try crop reason monitor spawn negative rather over calm glide

输入自定义密码进入 MetaMask

选择 Custom RPC 添加新网络 <http://127.0.0.1:7545>



配置 lite-server

bs-config.json 指示了 lite-server 的工作目录。

```
{
  "server": {
    "baseDir": ["/src", "/build/contracts"]
  }
}
```

package.json 文件的 scripts 中添加了 dev 命令

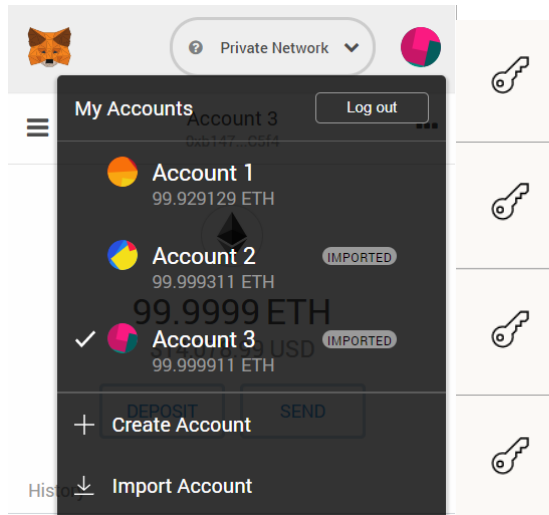
```
"scripts": {
  "dev": "lite-server",
  "test": "echo \"Error: no test specified\" && exit 1"
},
```

使用指令 `npm run dev` 启动 lite-server 运行并测试 DAPP

使用说明

1. 通过 MetaMask 可以实现多个账户对合约交互，合约拥有者为 Account 1

添加账户可以点击右上角，Import Account，复制 Ganache 中其中一个用户的
密钥并粘贴



 PRIVATE KEY

d571dd4dc40f23311f897cc52a7f2cfd7f29b4149a0ea61c1d072db7b9ad5f06

DONE

2. 使用 Account 1 可以给其他账户授权操作他的病历
3. Account 1 和被授权的账户可以查询和添加 Account 1 的病历记录

测试

输入存在空

Doctor's Address

0x7E0148D302C51B7F0f17

Doctor's Name

jack

Operation Times

Comfirm

localhost:3000 显示

Input cannot be empty

确定

操作次数不为正整数

Operation Times

-5

localhost:3000 显示

Operation tiems should be Positive integer

确定

授权者不是合约的持有者

66edbcff3d5f7a8e32ba577"], "method": "eth_sendRawTransactio
n"} Error: VM Exception while processing transaction: revert
Only owner can give right to operate this Medical Record.

确定

正常授权

Account 1

→

0x4396...1cbd

CONTRACT INTERACTION

0

\$0.00

DETAILS

DATA

GAS FEE

0.000184

\$0.03

TOTAL


0.000184

\$0.03

REJECT

CONFIRM

#22 - 12/31/2018 at 23:33



Contract Interaction

-0 ETH
-\$0.00 USD

CONFIRMED

授权用户添加记录

Operation Times

2

Comfirm

Add A New Medical Record

Disease Type

☒ Internal Medicine ☐ Surgery

Disease Name

test

Disease Symptom

test

Disease Treatment

test

Date

test

Comfirm

0

\$0.00

DETAILS

DATA

GAS FEE

0.000806

\$0.11

TOTAL

0.000806

\$0.11

REJECT

CONFIRM

#2 - 12/31/2018 at 23:36



Contract Interaction

-0 ETH
-\$0.00 USD

CONFIRMED

未授权用户添加记录

Authorize doctors to operate r

Doctor's Address

Doctor's Name

Operation Times

Add A New Medical Record

Disease Type ☒ Internal Medicine ☐ Surgery ☐

Disease Name

Disease Symptom

Disease Treatment

Date

MetaMask Notification

Account 3 → 0x4396...1cbd

CONTRACT INTERACTION

0
\$0.00

DETAILS DATA

GAS FEE 0.019158
\$2.70

AMOUNT + GAS FEE

TOTAL 0.019158
\$2.70

EDIT

ALERT: Transaction Error. Exception thrown in contract code.

REJECT CONFIRM

f2695168a46604b4c864aac07"],"method":"eth_sendRawTransac
tion"} Error: VM Exception while processing transaction: revert
You don't have right to operate this Medical Record

确定

获取病历记录还存在一点问题，改进和测试见 Github

Github 地址：<https://github.com/Zhanggen-sysu/MedicalRecord>

参考资料：<https://learnblockchain.cn/2018/01/12/first-dapp/#more>