区块链原理与技术 期末项目报告

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介绍

该项目主要是通过实践的方法来加深学习和理解区块链的相关原理知识，覆盖区块链的所有核心功能：

> - 网络节点通讯
> - 挖矿
> - 钱包
> - 交易和验证
> - 共识机制
> - 链式结构

涉及的如下知识点：

> - 密码学基础
> - 数字证书
> - Merkle树和SPV机制
> - Kademlia算法、P2P技术
> - 区块链共识机制
> - 比特币交易原理
> - 区块链网络设计

项目组成

迷你区块链客户端

项目环境

安装必要文件：

环境：*Anaconda2+python2*

安装必要库函数：使用pip安装

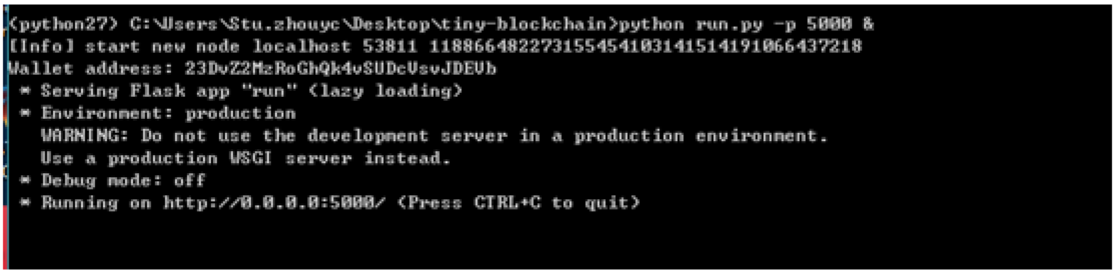
```
pip install gunicorn

pip install configparser

pip install rsa*

pip install constant
```

使用方法

Step1：启动迷你区块链客户端（模拟3个节点）

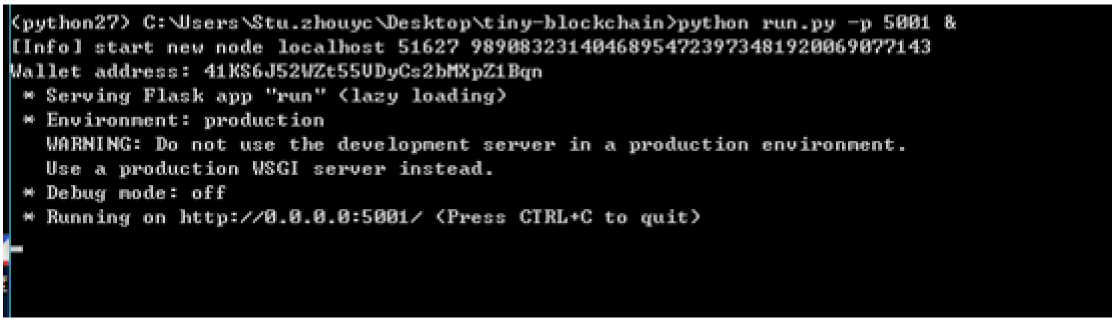
测试demo中一共使用3个节点，可以根据需要自己调节。

```
python run.py -p 5000 &
```



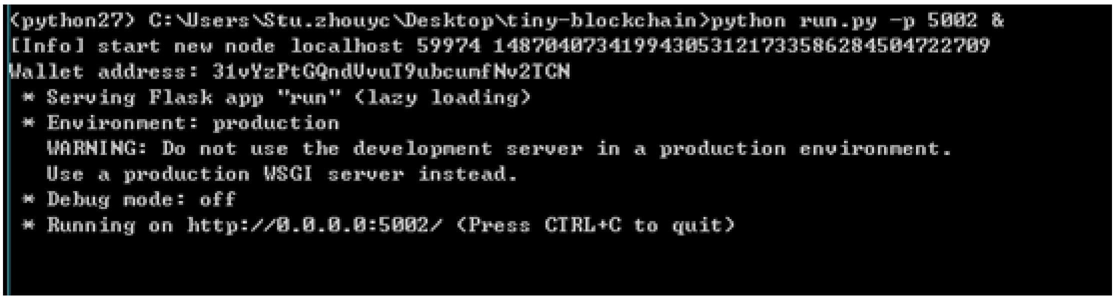
```
(python27) C:\Users\Stu.zhouyc\Desktop\tiny-blockchain>python run.py -p 5000 &
[Info] start new node localhost 53811 118866482273155454103141514191066437218
Wallet address: 23DvZ2MzRoGhQk4vSUDcVsvJDEVb
 * Serving Flask app "run" (lazy loading)
 * Environment: production
   WARNING: Do not use the development server in a production environment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://0.0.0.0:5000/ (Press CTRL+C to quit)
```

```
python run.py -p 5001 &
```



```
(python27) C:\Users\Stu.zhouyc\Desktop\tiny-blockchain>python run.py -p 5001 &
[Info] start new node localhost 51627 98908323140468954723973481920069077143
Wallet address: 41KS6J52WZt55VDyCs2bMXpZ1Bqn
 * Serving Flask app "run" (lazy loading)
 * Environment: production
   WARNING: Do not use the development server in a production environment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://0.0.0.0:5001/ (Press CTRL+C to quit)
_
```

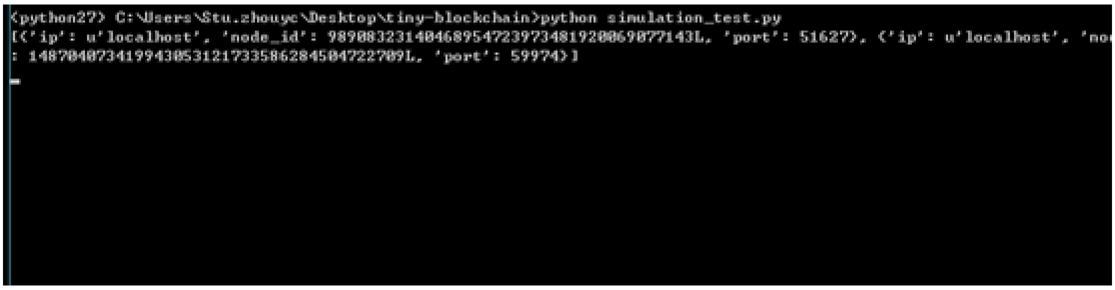
```
python run.py -p 5002 &
```



```
(python27) C:\Users\Stu.zhouyc\Desktop\tiny-blockchain>python run.py -p 5002 &
[Info] start new node localhost 59974 148704073419943053121733586284504722709
Wallet address: 31vYzPtGQndVvuT9ubcumfNv2TCN
 * Serving Flask app "run" (lazy loading)
 * Environment: production
   WARNING: Do not use the development server in a production environment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://0.0.0.0:5002/ (Press CTRL+C to quit)
```

Step2：模拟交易

```
python simulation_test.py
```



```
(python27) C:\Users\Stu.zhouyc\Desktop\tiny-blockchain>python simulation_test.py
[{'ip': u'localhost', 'node_id': 98908323140468954723973481920069077143L, 'port': 51627}, {'ip': u'localhost', 'no
: 148704073419943053121733586284504722709L, 'port': 59974}]
_
```

Step3: 迷你区块链的 json api接口调用

区块链客户端实现了json api，可以直接通过api调用来获取各个节点之间的信息：

（1）获取区块链高度

请求：

http://127.0.0.1:5001/height

返回：

{"code": 0, "value": 2}

（2）获取钱包余额

请求：

http://127.0.0.1:5001/balance?address=3Q7KKThJr5qcT7hM189AkVtqYLS8

返回：

```
{

   "address": "3Q7KKThJr5qcT7hM189AkVtqYLS8",

  "balance": 24

}
```

（3）获取区块信息

请求：

http://127.0.0.1:5001/block_info?height=1

返回：

```
{

  "current_hash": "00003b4ff8851ab57625b8d6a432c9288659ce91f52a5b1854b37a34c07ffee8",

  "difficulty": 4,

  "index": 0,

  "merkleroot": "24b486df77c70ba076f92e1ccd078f8073d596c73a29baf0a8f3aea948a54815",

  "nonce": 7534,

  "previous_hash": "00000000000000000000000000000000000000000000000000000000000000",

  "timestamp": 1496518102,


  "transactions": [
    {

      "amount": 0,

      "receivers": [

        {

          "receiver": "23DvZ2MzRoGhQk4vSUDcVsvJDEVb",

          "value": 100

        }

      ],

      "senders": [],

      "timestamp": 1496518102,

      "txid": "ab9d943d8c126189f80484a0c8ade846038797968bf90fd1ed9e88f2f46f54fa"

    }

  ]

}
```

(4) 创建一笔交易

请求:

http://127.0.0.1:5000/transactions/new

```
{
    'amount': 1,
    'sender': u'23DvZ2MzRoGhQk4vSUDcVsvJDEVb',
    'receiver': u'2dgzLQJgWKhdt3ETnf3tFA9m4ZpK'
}
```

返回:

```
{

    "message": "new transaction been created successfully!",

    "current_transactions": [

        {

            "timestamp": 1538373019,
            "txouts": [
                {
                    "value": 30,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "752f3a7934aa60d041250346e24b1d7a2886dbb0",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                },
                {
                    "value": 14,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "ac280f709f81ec4eca086f1abfd0f3bec8baf395",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                }
            ],
            "txins": [
                {
                    "prev_tx_out_idx": 1,
                    "pubkey_hash": "ac280f709f81ec4eca086f1abfd0f3bec8baf395",
                    "prev_txid":
"2f096e332b2371cd141d1f279c35fb820e3e5256c1a071c5a49636c2fcd9be3d",

                    "signature":
"e751d626ef0c147455ef0487b85f108ba56be57575f5133341e5e638dc697f94"

                }

            ],

            "txid": "8851e30bd03cd81b396df1904a17a87b89a30092a92572f7a66fce7a25a634c4"

        },

        {

            "timestamp": 1538373058,

            "txouts": [

                {

                    "value": 9,

                    "scriptPubKey": [

                        "OP_DUP",

                        "OP_HASH160",

                        "752f3a7934aa60d041250346e24b1d7a2886dbb0",

                        "OP_EQUALVERIFY",

                        "OP_CHECKSIG"

                    ]

                },

                {

                    "value": 46,

                    "scriptPubKey": [

                        "OP_DUP",

                        "OP_HASH160",

                        "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",


                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                }
            ],
            "txins": [
                {
                    "prev_tx_out_idx": 0,
                    "pubkey_hash": "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                    "prev_txid":
"2f096e332b2371cd141d1f279c35fb820e3e5256c1a071c5a49636c2fcd9be3d",
                    "signature":
"0ff0b888d0dd468f1c6e37d1ab13d17f63747346dc0105b5e4974be71023079f"
                },
                {
                    "prev_tx_out_idx": 0,
                    "pubkey_hash": "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                    "prev_txid":
"72fb55e194e4d7dc71ab020483c61737c6a5b2e2474480cac4187f0633961423",
                    "signature":
"de72585b9c7c6a47d1adc2851244232581cc5f3e0a4633d754736677bdea0a57"
                },
                {
                    "prev_tx_out_idx": 1,
                    "pubkey_hash": "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                    "prev_txid":
"3bc92a17262ce2cc1fe7f34ef946fd10e0b9667f223b697bfaf520e5f443be11",
                    "signature":
"2871832295c53372ee44d9950676cb4675506676a9dce04db54e48b72b40a2b1"
                }
            ],
            "txid": "252d4e493ff514e87f3c00d9adcb635aba5f7c3b7890b7ccc1e17d73c23d1bf4"
        },
        {
            "timestamp": 1538373093,
            "txouts": [
                {
                    "value": 10,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "ac280f709f81ec4eca086f1abfd0f3bec8baf395",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                },
                {
                    "value": 36,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                }

            ],
                },
            "txins": [
                {
                    "prev_tx_out_idx": 1,
                    "pubkey_hash": "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                    "prev_txid":
"252d4e493ff514e87f3c00d9adcb635aba5f7c3b7890b7ccc1e17d73c23d1bf4",
                    "signature":
"fc33dea5c178d38c4d98623e7a0fe881b9c6268088788b34c81b4b49a1cbe385"
                }
            ],
            "txid": "31cabe8dd4c9b7b03b9159409bc1929acbcefe361099bad5839c17cce497af8e"
        },
        {
            "timestamp": 1538373570,
            "txouts": [
                {
                    "value": 1,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "752f3a7934aa60d041250346e24b1d7a2886dbb0",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                },
                {
                    "value": 35,
                    "scriptPubKey": [
                        "OP_DUP",
                        "OP_HASH160",
                        "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                        "OP_EQUALVERIFY",
                        "OP_CHECKSIG"
                    ]
                }
            ],
            "txins": [
                {
                    "prev_tx_out_idx": 1,
                    "pubkey_hash": "4a879c658a42fc162f8cb3c740a4e0c4b63e80de",
                    "prev_txid":
"31cabe8dd4c9b7b03b9159409bc1929acbcefe361099bad5839c17cce497af8e",
                    "signature":
"adf76d1f32fb122fe2551b3e3059d64d9d11787f58cea37ec8e7ff1b3b540dd7"
                }
            ],
            "txid": "5bc1e91e8156710706934ee109976a71bdbac04b0d83e081844decb2a4d6ed15"
        }
    ]
}
```