區塊鏈的介紹及其應用 HW1 Personal Report(PDF)
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A. (45%) Complete 3 functions for both the miner and the customer
B. (15%) Detailed annotations and descriptions of how each function is performed in section (a)

- **final_miner.py**

```
# 查詢指定地址的帳戶餘額
def get_balance(self, account):
    balance = 0
    # *-----------ToDo-----------*
    # Traverse the blockchain to get the balance
    ## for block in self.chain:
    for block in self.chain:
        fee_cnt = 0
        for transaction in block.transactions:
            fee_cnt += transaction.fee
            if (transaction.receiver == account):
                balance += transaction.amounts
            elif (transaction.sender == account):
                balance -= transaction.amounts + transaction.fee
        if (block.miner == account):
            balance += fee_cnt + self.mining_rewards

    # Add the test token that the customer had already applied
    for i in self.address_table:
        if account == i[0]:
            balance += i[1]
            break

    return balance
```

先遍歷整個 blockchain，分別對每個 block 進行動作，遍歷這個 block 中的所有 transactions，若有符合的 sender 或 receiver，則對 balance 進行增減。以變數 fee_cnt 儲存這個 block 中所有 transactions 的手續費 (transaction fee)，如果此 block 為查詢 get_balance 的礦工本身所挖到的，則在 balance 加上 fee_cnt 與這個 block 的 reward。

```python
def initialize_transaction(self, sender, receiver, amount, fee, message):
    # *-----------ToDo-----------*
    # 使用 get_balance 確認交易發起方有足夠的帳戶餘額完成這筆交易!
    ## 若帳戶餘額不足請回傳 "Balance not enough!"
    ## 若帳戶餘額足夠則回傳一個 Transaction 物件
    if (self.get_balance(sender) >= amount + fee):
        return Transaction(sender, receiver, amount, fee, message)
    else:
        return "Balance not enough!"
```

判斷交易發起方的帳戶是否有足夠的餘額，是則回傳 Transaction 物件，否則回傳 “Balance not enough!”。

- **final_customer.py**

```python
def initialize_transaction(sender, receiver, amount, fee, message):
    # *-----------ToDo-----------*
    ## Same to the work in miner.py , but no need to check balance !!!
    ## 請回傳一個 Transaction 物件
    return Transaction(sender, receiver, amount, fee, message)
```

回傳 Transaction 物件。

C. (33%) Running Results with 11 snapshots (Team work)

Step 1 Start mining

```
Address: MEgCQQCL9oVbLVcUkcmq3LV9vnFJA8E7gnDwcGmiDbORFUaLxKV2Bc3Eb6Je+o1XeDRJC8mSwtSkhSM2H78M1kXNh2zJAgMBAAE=
Create genesis block...
In interrup_control function : input value 0 to interrup current work on mining new block. Hash found: 0000002e4702d8a03
71821d88767588509b686d7 @ difficulty 5, time cost: 0.4375s
balance amount:  10
Hash found: 00000778a346f29b7649a99fa58a1512b808c64b @ difficulty 5, time cost: 0.42188s
balance amount:  20
Hash found: 00000d341776431290l3c8a10afb107355bdcef1 @ difficulty 5, time cost: 0.34375s
balance amount:  30
Hash found: 0000044d8d1bb791da979aa107c66b2ebb3d4b85 @ difficulty 5, time cost: 0.4375s
balance amount:  40
Hash found: 00000571a18302eb367003aa0d9bed39bf446df3 @ difficulty 5, time cost: 0.65625s
balance amount:  50
```

Step 2 Command 1: Generate_address

```
Successfully connect to miner
Command list:
1. generate_address
2. get_balance
3. transaction
4. close the application
5. apply some test tokens
Command: 1
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
Private key: MIIBPAIBAAJBANsEopODVZYeeJBxCZP0/GyHjFWggPKvkO2uh+h14chJV8F/OGPwzYmGdPt8TXDHS5774/zDziM5ueL/ik7pcsMCAwEAAQJ
AGSGPBh4r0+3rJ6fQ0Ylq7YkgMTMZmL9Mgflk3uenx3e3MiZFp3iXYigPUmx+a1zgLBs3ydN2sMGbdL4stiJqAQIjANvphkI4pGpaH2qO6Gb7roHUlo3qwnC
AS+RQ43brydHw2lkCHwD+9Yy2T4Z5rXLf6UmGd8GzUDf/82VMpKPZ91qvmnsCIim9Vi1FgPdqqaHZBAVf6cxcpELFdyhRQZZRQAs3T7QYSekCHwC0snM4AsT
cGAICj+R8WQP/gisuS+LPnyBBqv2q12ECImFlPmqh4DmaBl2rpaIyg1Qj5PeXyWxucctoxT42p+MyEc=
Successfully send the address to miner.
Update local address table.
Node 1 :  MEgCQQCL9oVbLVcUkcmq3LV9vnFJA8E7gnDwcGmiDbORFUaLxKV2Bc3Eb6Je+o1XeDRJC8mSwtSkhSM2H78M1kXNh2zJAgMBAAE=
```

Step 3 Command 2: Get_balance

```
Command: 2
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
Balance =  0
```

Step 4 Command 5: Apply some test token

```
Command: 5
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
How many tokens you are going to apply : 20
```

Step 5 Command 2: Get_balance (sender and receiver)

```
Command: 2
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
Balance =  20
```

(sender)

```
Command: 2
Address: MEgCQQCPZziH9NKG3OKTavk7DRmBYaNwquBPojpLVZyPx2CNaW06wpMGQQMUoX/BeT1glF0bI9DIpAcXKwqHeGY8m/Q5AgMBAAE=
Balance =  0
```

(receiver)

Step 6 Command 3: Transaction

```
Command: 3
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
Private_key: MIIBPAIBAAJBANsEopODVZYeeJBxCZP0/GyHjFWggPKvkO2uh+h14chJV8F/OGPwzYmGdPt8TXDHS5774/zDziM5ueL/ik7pcsMCAwEAAQJ
AGSGPBh4r0+3rJ6fQ0Ylq7YkgMTMZmL9Mgflk3uenx3e3MiZFp3iXYigPUmx+a1zgLBs3ydN2sMGbdL4stiJqAQIjANvphkI4pGpaH2qO6Gb7roHUlo3qwnC
AS+RQ43brydHw2lkCHwD+9Yy2T4Z5rXLf6UmGd8GzUDf/82VMpKPZ91qvmnsCIim9Vi1FgPdqqaHZBAVf6cxcpELFdyhRQZZRQAs3T7QYSekCHwC0snM4AsT
cGAICj+R8WQP/gisuS+LPnyBBqv2q12ECImFlPmqh4DmaBl2rpaIyg1Qj5PeXyWxucctoxT42p+MyEc=
Receiver: MEgCQQCPZziH9NKG3OKTavk7DRmBYaNwquBPojpLVZyPx2CNaW06wpMGQQMUoX/BeT1glF0bI9DIpAcXKwqHeGY8m/Q5AgMBAAE=
Amount: 5
Fee: 1
Comment: m11215032
True
```

Step 7 Command 2: Get_balance (sender and receiver)

```
Command: 2
Address: MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=
Balance =  14
```

(sender)

```
Command: 2
Address: MEgCQQCPZziH9NKG3OKTavk7DRmBYaNwquBPojpLVZyPx2CNaW06wpMGQQMUoX/BeT1glF0bI9DIpAcXKwqHeGY8m/Q5AgMBAAE=
Balance =  5
```

(receiver)

Step 8 Command 4: Close (2 different IP address by customer1 and customer2)

```
parsed_message :  {'request': 'close'}
address 'MEgCQQDbBKKTg1WWHniQcQmT9Pxsh4xVoIDyr5DtrofodeHISVfBfzhj8M2JhnT7fE1wx0ue++P8w84jObni/4pO6XLDAgMBAAE=' has disco
nnected to the miner.
```

(customer1)

```
parsed_message :  {'request': 'close'}
address 'MEgCQQCPZziH9NKG3OKTavk7DRmBYaNwquBPojpLVZyPx2CNaW06wpMGQQMUoX/BeT1glF0bI9DIpAcXKwqHeGY8m/Q5AgMBAAE=' has disco
nnected to the miner.
```

(customer2)

D. (7%) Experience

這個作業讓我們實際進行一個簡單的區塊鏈模擬，包括礦工挖礦、查詢餘額與進行交易等功能，上課或單純閱讀資料能在理論上了解區塊鏈的運作，但沒有實際演練過就無法了解區塊鏈運作的細節，實際運行整個流程讓我對於區塊鏈整體的設計、概念與細節有更多的了解，雖然這個作業只是簡化的區塊鏈，但是對於與書上的知識結合、了解區塊鏈其中一部份的運作原理已經綽綽有餘了。