Nodejs
200行的迷你區塊鏈

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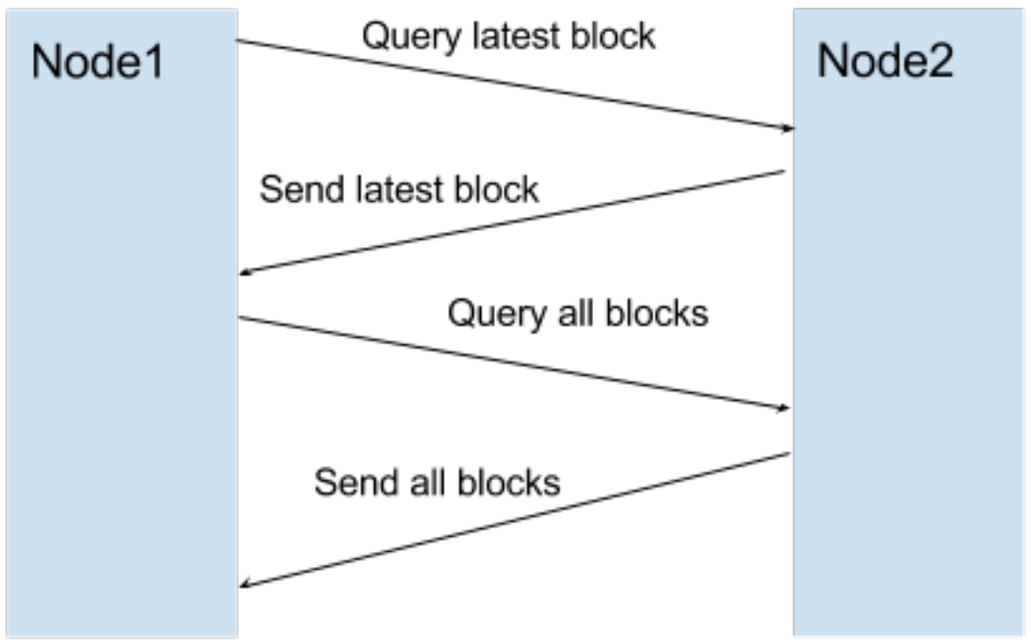
觀念講解

一個區塊鏈系統包含什麼？

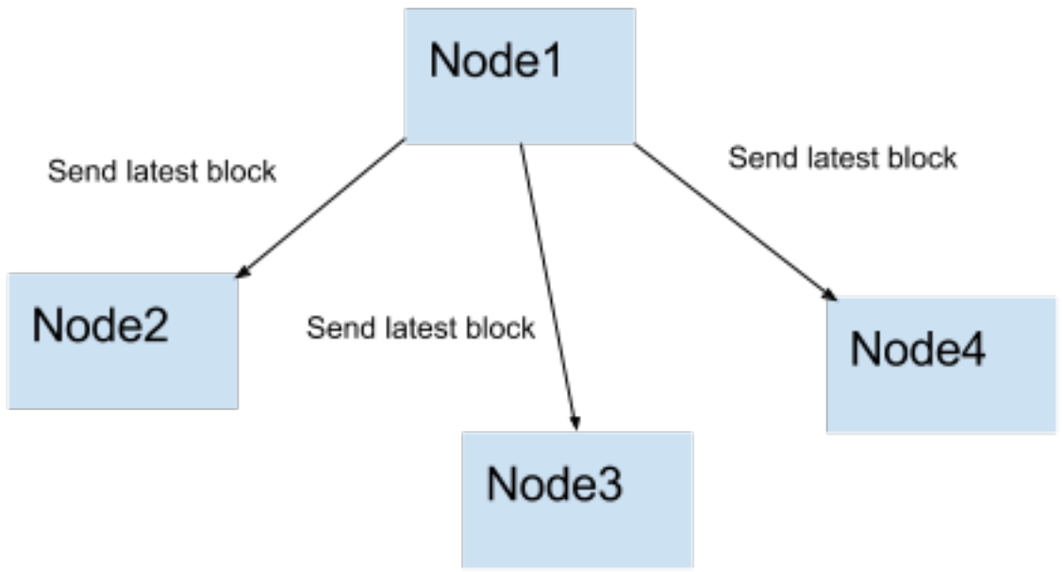
- p2p網路
- 共識系統
- 區塊定義與結構
- 區塊鏈的構成
- 交易

僅200行程式碼的最小的區塊鏈系統

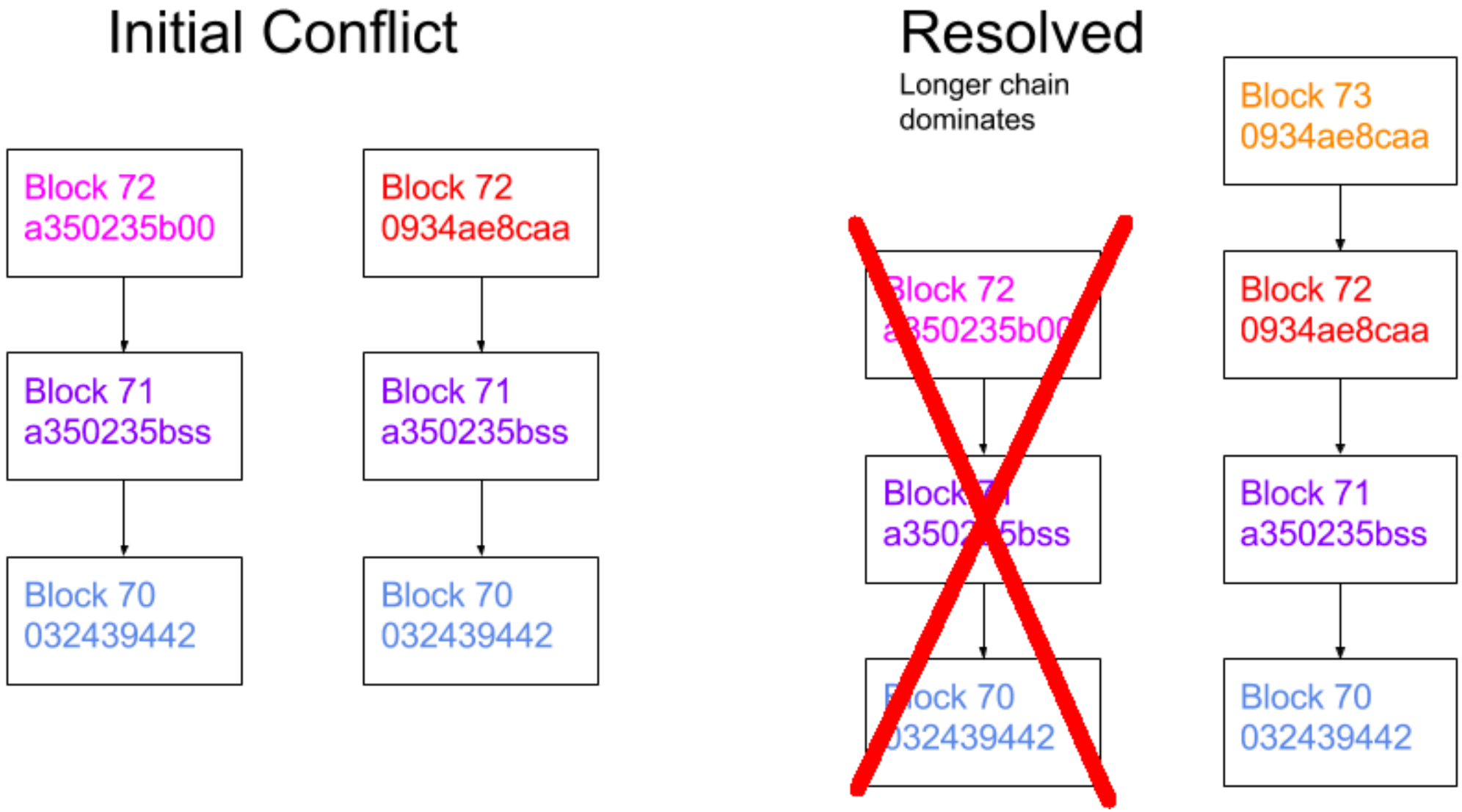
Node1 connects and syncs with Node2



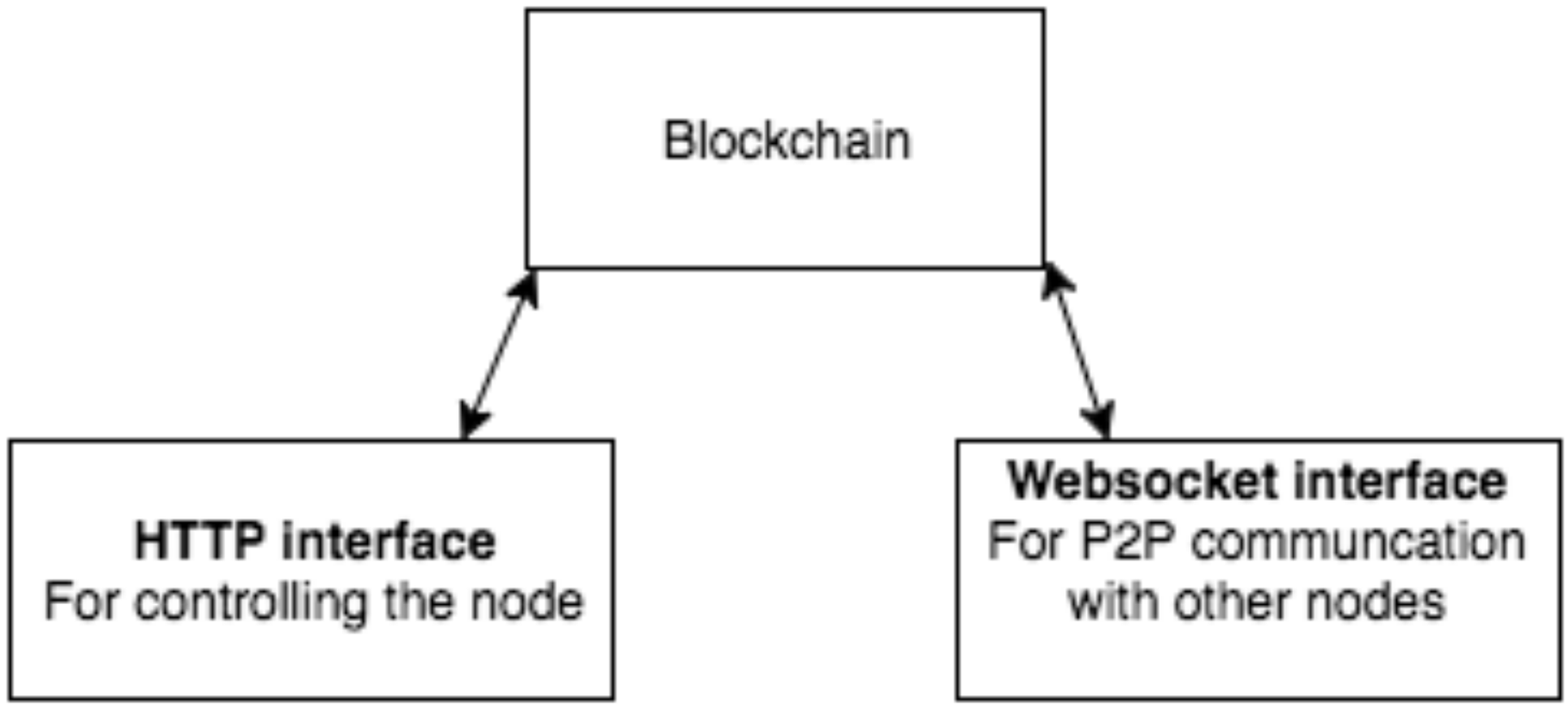
Node1 generates a block and broadcasts it



Choosing the longest chain



Architecture



200行程式碼的迷你區塊鏈

- 每一個節點都是 websocket server
- 每一個節點都是 websocket client

程式初始化

主程式 main.js

- connectToPeers(initialPeers);
- initHttpServer();
- initP2PServer();

connectToPeers(initialPeers);

```
var connectToPeers = (newPeers) => {
    newPeers.forEach((peer) => {
        var ws = new WebSocket(peer);
        ws.on('open', () => initConnection(ws));
        ws.on('error', () => {
            console.log('connection failed')
        });
    });
};
```

```
var initConnection = (ws) => {
    sockets.push(ws);
    initMessageHandler(ws);
    initErrorHandler(ws);
    write(ws, queryChainLengthMsg());
};
```

initHttpServer();

```
var initHttpServer = () => {
    var app = express();
    app.use(bodyParser.json());

    app.get('/blocks', (req, res) => res.send(JSON.stringify(blockchain)));
    app.post('/mineBlock', (req, res) => {
        var newBlock = generateNextBlock(req.body.data);
        addBlock(newBlock);
        broadcast(responseLatestMsg());
        console.log('block added: ' + JSON.stringify(newBlock));
        res.send();
    });
    app.get('/peers', (req, res) => {
        res.send(sockets.map(s => s._socket.remoteAddress + ':' + s._socket.remotePort));
    });
    app.post('/addPeer', (req, res) => {
        connectToPeers([req.body.peer]);
        res.send();
    });
    app.listen(http_port, () => console.log('Listening http on port: ' + http_port));
};
```

initP2PServer();

```
var initP2PServer = () => {
    var server = new WebSocket.Server({port: p2p_port});
    server.on('connection', ws => initConnection(ws));
    console.log('listening websocket p2p port on: ' + p2p_port);

};
```

Linux上的Node.js安裝

-Linux系統(以Ubuntu為例) 通常無法裝到最新版，可採自行編譯Nodejs的方式安裝到最新版

1.使用app-get 來安裝，若是CentOS則用yum install

- $ sudo apt-get install nodejs
- $ sudo apt-get install npm

更新Node.js的版本

- in Mac OS

  brew upgrade node

- in linux

  sudo npm cache clean -f

  sudo npm install -g n

  sudo n stable

  sudo n latest

  sudo ln -sf /usr/local/n/versions/node/8.1.2/bin/node /usr/bin/node

自行編譯Nodejs

- sudo apt-get install gcc g++
- sudo apt-get install make
- wget https://nodejs.org/dist/v8.1.2/node-v8.1.2.tar.gz
- 或git clone https://github.com/nodejs/node
- tar xvf node-v8.1.2.tar.gz
- cd node-v8.1.2
- ./configure
- make or make -j4
- sudo make install

自行編譯Nodejs

- sudo apt-get install build-essential libtool autotools-dev automake pkg-config libssl-dev libevent-dev bsdmainutils
- wget https://nodejs.org/dist/v8.1.2/node-v8.1.2.tar.gz
- 或git clone https://github.com/nodejs/node
- tar xvf node-v8.1.2.tar.gz
- cd node-v8.1.2
- ./configure
- make or make -j4
- sudo make install

Nodejs 開發編輯器

- Visual Studio Code (VS Code)
- sublime
- Bracket

安裝NaiveChain

- chmod +x docker_install.sh
- sudo apt-get install docker-compose
- git clone https://github.com/rslu2000/naivechain
- cd naivechain
- npm install

一次部署快速三個節點

- **docker-compose up**

或從docker安裝啟動也可以

- chmod +x docker_install.sh
- sudo apt-get install docker-compose

```
$  git clone https://github.com/rslu2000/naivechain
$ cd naivechain
$ docker-compose up (這個指令會去開啟docker-compose.yml)
```

package.json

18 lines (17 sloc) | 287 Bytes

```
{
  "name": "naivechain",
  "version": "1.0.0",
  "description": "",
  "scripts": {
    "start": "node main.js"
  },
  "dependencies": {
    "body-parser": "^1.15.2",
    "crypto-js": "^3.1.6",
    "express": "~4.11.1",
    "ws": "^1.1.0"
  },
  "engines": {
    "node": ">=4.3.2"
  }
}
```

HTTP API

- Get blockchain

  curl http://localhost:3001/blocks

- Create block

  curl -H "Content-type:application/json" --data '{"data" : "Some data to the first block"}' http://localhost:3001/mineBlock

- Add peer

  curl -H "Content-type:application/json" --data '{"peer" : "ws://localhost:6001"}' http://localhost:3001/addPeer

- Query connected peers

  curl http://localhost:3001/peers

運行NaiveChain

- HTTP_PORT=3001 P2P_PORT=6001 npm start **(運行第一個節點)**
- HTTP_PORT=3002 P2P_PORT=6002 PEERS=ws://localhost:6001 npm start **(運行第二個節點, 同時去把第一個節點給連起來)**
- HTTP_PORT=3003 P2P_PORT=6003 PEERS=ws://localhost:6001 npm start **(運行第三個節點, 同時去把第一個節點給連起來)**
- HTTP_PORT=3004 P2P_PORT=6004 PEERS=ws://localhost:6001 npm start **(運行第四個節點, 同時去把第一個節點給連起來)**
- curl -H "Content-type:application/json" --data '{"data" : "Some data to the first block"}' http://localhost:3001/mineBlock

如何發出一筆交易？

- curl -H "Content-type:application/json" --data '{"data" : "Some data to the first block"}' http://localhost:3001/mineBlock

- curl -H "Content-type:application/json" --data '{"data" : "興農農藥化學廠出貨2頓氰化鉀"}' http://35.194.173.37:3001/mineBlock

- curl -H "Content-type:application/json" --data '{"data" : "興農農藥化學廠出貨1頓“孔雀綠”給長榮化工高雄廠"}' http://35.194.173.37:3002/mineBlock

查詢區塊鏈的內容

- 打開瀏覽器
- 在網址列輸入匡之中 鍵入：

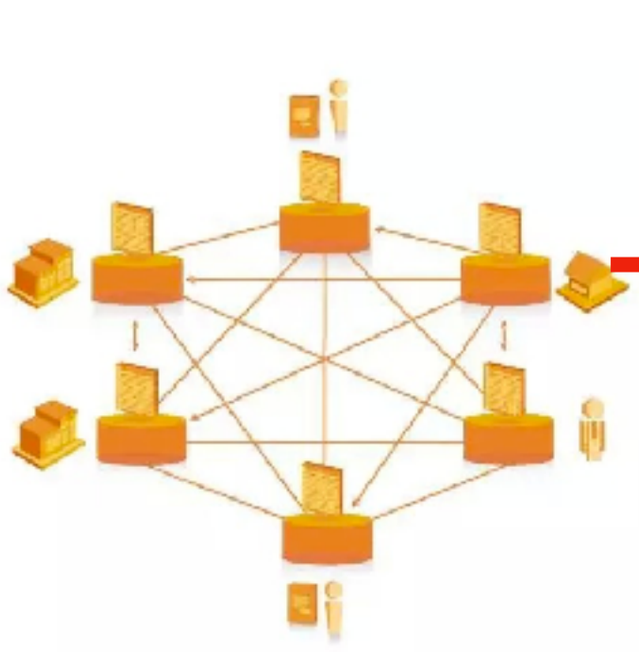
- http:// 你的ip:3001/blocks　或 http:// 你的ip:3002/blocks 或 http:// 你的ip:3003/blocks

請鄰座同學一起加入節點成為區塊鏈成員

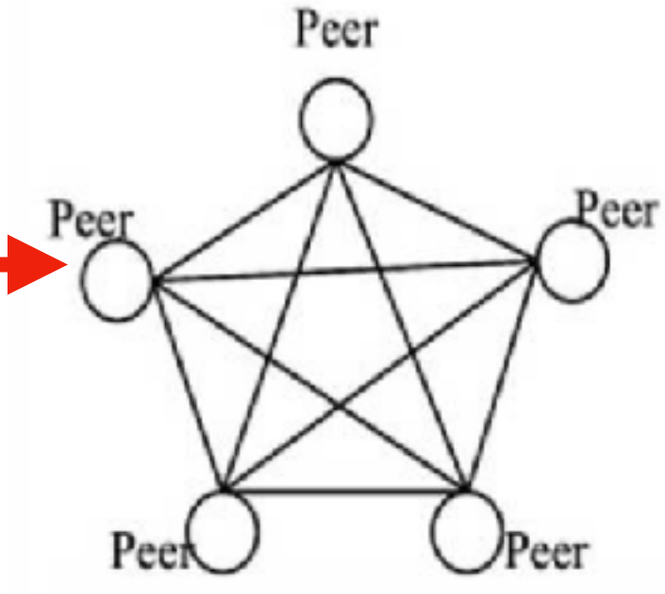
- HTTP_PORT=3002 P2P_PORT=6002 PEERS=ws://**同學的ip:6001** npm start **(運行自己的節點, 同時去把某同學的節點給連起來)**

兩條區塊鏈結成聯盟
將對方加入節點

- curl -H "Content-type:application/json" --data '{"peer" : "ws://**35.194.228.1:6001**"}' http://localhost:3002/addPeer



區塊高度為5



區塊高度為3

台灣鏈 與 日本鏈 之相關網路設定

- 台灣鏈 實體對外ip = 35.189.185.27
- 日本鏈 實體對外ip = 104.198.118.48

台灣鏈上所發出過的交易明細

curl -H "Content-type:application/json" --data '{"data" : "台灣鏈第一筆帳"}' http://localhost:3001/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "台灣鏈第二筆帳"}' http://localhost:3002/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "台灣鏈第三筆帳"}' http://localhost:3003/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "台灣鏈第四筆帳"}' http://localhost:3001/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第一筆帳"}' http://localhost:3001/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第二筆帳"}' http://localhost:3001/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第三筆帳"}' http://localhost:3001/mineBlock

日本鏈上所發出過的交易明細

curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第一筆帳"}' http://localhost:3001/mineBlock

curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第二筆帳"}' http://localhost:3002/mineBlock

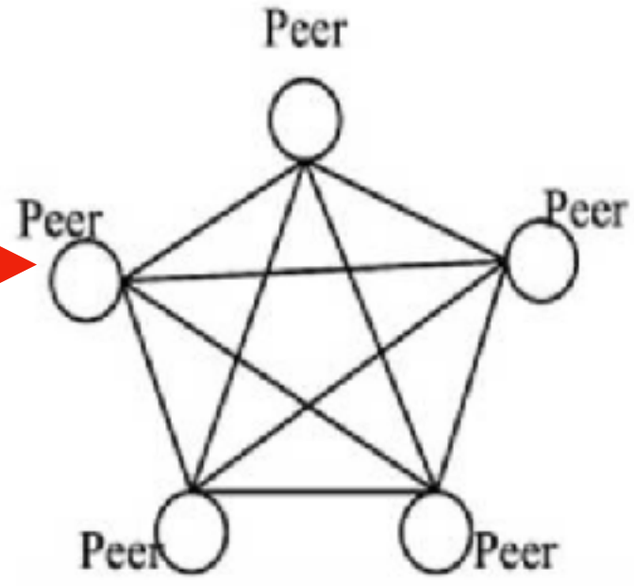
curl -H "Content-type:application/json" --data '{"data" : "日本回報台灣總部的第三筆帳"}' http://localhost:3003/mineBlock

將日本鏈與台灣鏈結成聯盟

將對方加入節點

- curl -H "Content-type:application/json" --data '{"peer" : "ws://**104.198.118.48:6002**"}' http://35.189.185.27:3002/addPeer
- curl -H "Content-type:application/json" --data '{"peer" : "ws://35.189.185.27**:6002**"}' http://**104.198.118.48**:3002/addPeer

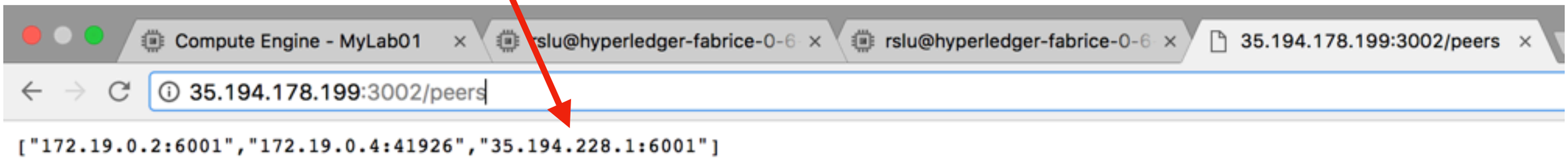
區塊高度為7

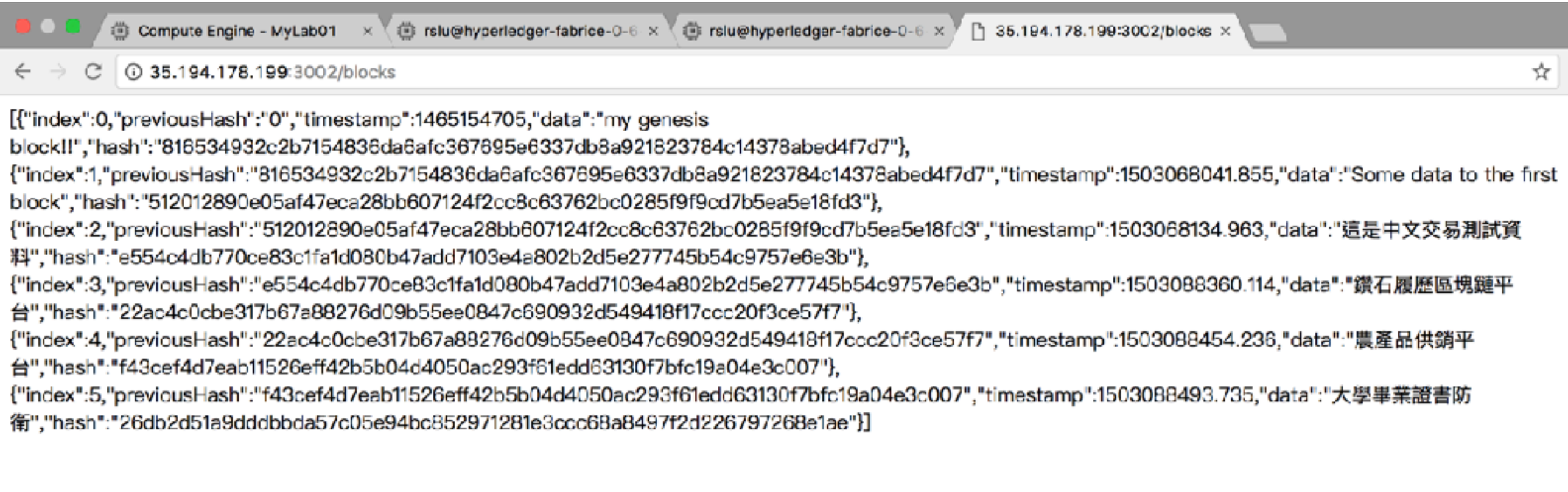


區塊高度為3

- curl -H "Content-type:application/json" --data '{"peer" : "ws://**35.194.228.1:6001**"}' http://localhost:3002/addPeer

測試結果





原本比較短鏈的那個區塊鏈上的節點會發生什麼事？


```
Received message{"type":2,"data":"[{\"index\":0,\"previousHash\":\"0\",\"timestamp\":1465154705,\"data\":\"my genesis block!!\",\"hash\":\"816534932c2b7154836da6afc
367695e6337db8a921823784c14378abed4f7d7\"},{\"index\":1,\"previousHash\":\"816534932c2b7154836da6afc367695e6337db8a921823784c14378abed4f7d7\",\"timestamp\":15030680
41.855,\"data\":\"Some data to the first block\",\"hash\":\"512012890e05af47eca28bb607124f2cc8c63762bc0285f9f9cd7b5ea5e18fd3\"},{\"index\":2,\"previousHash\":\"5120
12890e05af47eca28bb607124f2cc8c63762bc0285f9f9cd7b5ea5e18fd3\",\"timestamp\":1503068134.963,\"data\":\"這是中文交易測試資料\",\"hash\":\"e554c4db770ce83c1fa1d080b47
add7103e4a802b2d5e277745b54c9757e6e3b\"},{\"index\":3,\"previousHash\":\"e554c4db770ce83c1fa1d080b47add7103e4a802b2d5e277745b54c9757e6e3b\",\"timestamp\":1503088360
.114,\"data\":\"鑽石履歷區塊鏈平台\",\"hash\":\"22ac4c0cbe317b67a88276d09b55ee0847c690932d549418f17ccc20f3ce57f7\"},{\"index\":4,\"previousHash\":\"22ac4c0cbe317b67
a88276d09b55ee0847c690932d549418f17ccc20f3ce57f7\",\"timestamp\":1503088454.236,\"data\":\"農產品供銷平台\",\"hash\":\"f43cef4d7eab11526eff42b5b04d4050ac293f61edd63
130f7bfc19a04e3c007\"},{\"index\":5,\"previousHash\":\"f43cef4d7eab11526eff42b5b04d4050ac293f61edd63130f7bfc19a04e3c007\",\"timestamp\":1503088493.735,\"data\":\"大
學畢業證書防偽\",\"hash\":\"26db2d51a9dddbbda57c05e94bc852971281e3ccc68a8497f2d226797268e1ee\"}]"}
blockchain possibly behind. We got: 2 Peer got: 5
Received blockchain is longer than current blockchain
Received blockchain is valid. Replacing current blockchain with received blockchain
```