

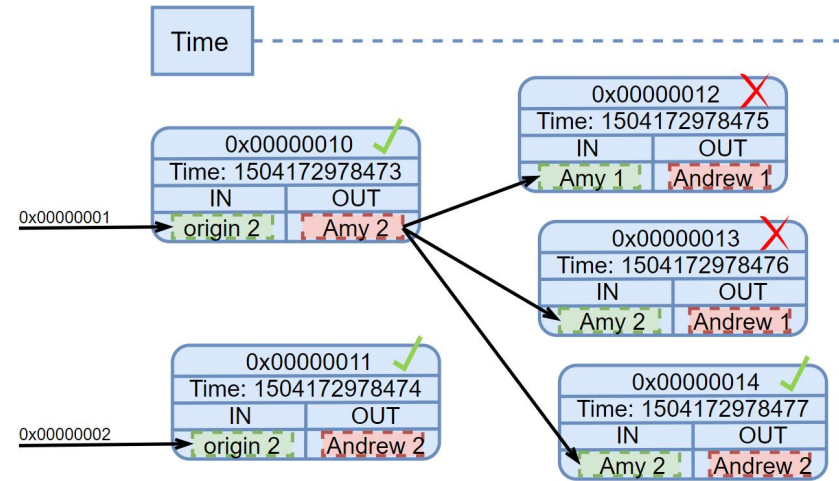
Level 3 - Transaction Linking

Definitions

- We are moving from an account and balance based system to a transaction based system - so accounts and balances are no longer necessary
- Funds are passed on through transaction linking

Task

- Filter invalid transactions
- Report valid transactions



Transactions

Transactions

- Can have multiple input and output elements
- Sum of input amounts must match sum of output amounts
- Input elements must be output elements of previous transactions
 - Except initial funding that comes from **origin**
 - Any other funding must have been the output of a valid previous transaction, that is **mentioned** in the input file
- An **owner** is only allowed to be listed **once** in the transaction **output elements** of a single transaction.
- Input elements need to be **spent completely** / One transaction output element can only be used once for input
- Any amount has to be an integer number **greater zero**
- Transactions are executed in order of submission time
- You can assume that the submission time is unique amongst transactions

Data format

Input

`<NumberOfTransactions>` the number of transactions in the banking system

NumberOfTransactions lines: `<TransactionID>` `<NumberOfInputs>` `NumberOfInputs * InputElement` `<NumberOfOutputs>`

`NumberOfOutputs * OutputElement` `<TransactionSubmitTime>`

InputElement: `<InputTransactionID>` `<InputTransactionOwner>` `<InputTransactionAmount>`

OutputElement: `<OutputTransactionOwner>` `<OutputTransactionAmount>`

Output

`<NumberOfValidTransactions>` the number of transactions in the banking system

NumberOfValidTransactions lines: `<TransactionID>` `<NumberOfInputs>` `NumberOfInputs * InputElement`

`<NumberOfOutputs>` `NumberOfOutputs * OutputElement` `<TransactionSubmitTime>`

InputElement: `<InputTransactionID>` `<InputTransactionOwner>` `<InputTransactionAmount>`

OutputElement: `<OutputTransactionOwner>` `<OutputTransactionAmount>`

Example

Input

```
5
0x00000010 1 0x00000001 origin 2 1 Amy 2 1504172978473
0x00000011 1 0x00000002 origin 2 1 Andrew 2 1504172978474
0x00000012 1 0x00000010 Amy 1 1 Andrew 1 1504172978475
0x00000013 1 0x00000010 Amy 2 1 Andrew 1 1504172978476
0x00000014 1 0x00000010 Amy 2 1 Andrew 2 1504172978477
```

Output

```
3
0x00000010 1 0x00000001 origin 2 1 Amy 2 1504172978473
0x00000011 1 0x00000002 origin 2 1 Andrew 2 1504172978474
0x00000014 1 0x00000010 Amy 2 1 Andrew 2 1504172978477
```

