Cryptocurrency Engineering and Design

MAS.S62

2/7/2018 Lecture 1

Introduction

- Who we are
  - Neha Narula
  - Tadge Dryja
  - James Lovejoy (TA)
- Digital Currency Initiative
- Course
  - Lectures (20%)
  - Labs (40%)
  - Final project (40%)

Housekeeping

- Signup sheet
- Register!
- https://github.com/mit-dci/mas.s62
- fiorenza@mit.edu to join blockchain lunches, W 11:45 AM at Sloan
- Office hours Tuesdays 4-6 PM
- freenode #mass62

Cryptocurrency Engineering and Design

- What is a cryptocurrency?
- How is it different than a regular currency?
- What does it mean to build one?

What we are not going to do

- How to ICO
- Trading advice
- Permissioned blockchains

Origins of Money

SECURITY DEPOSIT RECEIPT

Owner/Lessor: _____

Renter/Lessee: _____

Property Address: _____

Security Deposit Amount: _____

Received From: _____

Name/Address of financial institution where funds will be held:

_____

_____

Traditional payments

Alice: $10
Bob: $0

"I, Alice, would like to send Bob $5"

Alice

Bob

Traditional payments

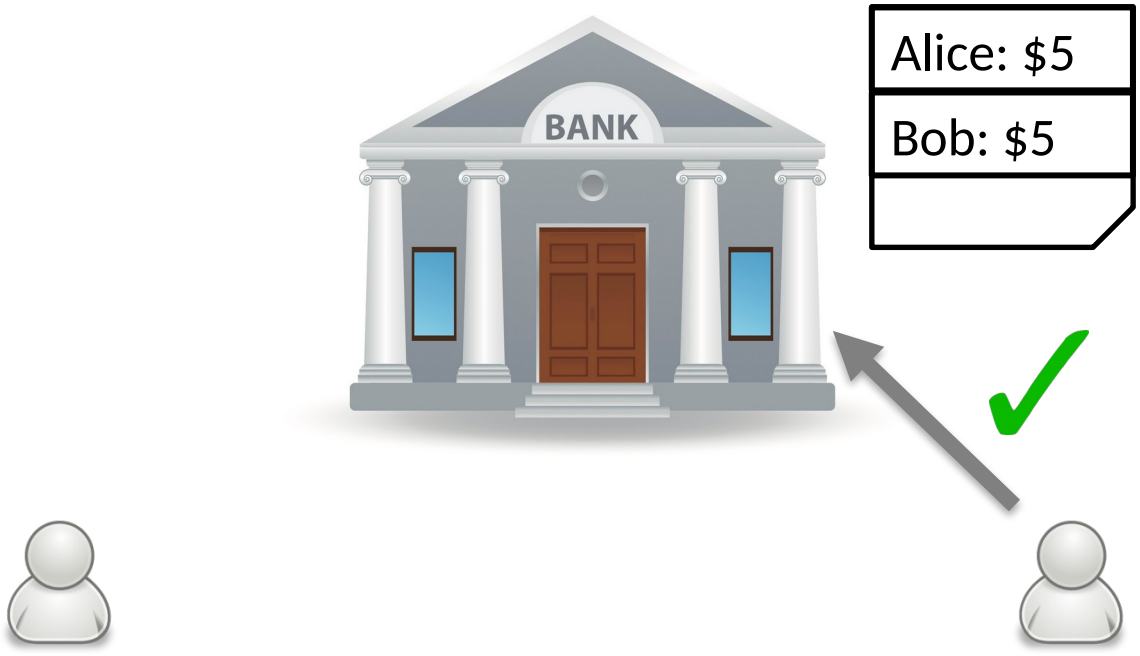
Alice: $5
Bob: $5

Alice

Bob, I sent you $5!

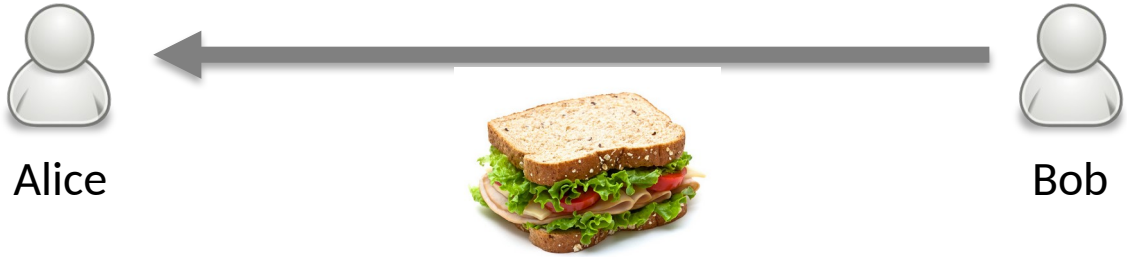
Bob

Traditional payments



Traditional payments

Alice: $5
Bob: $5



Pros/cons of banks

Pros

- Digital payments

Cons

- Not peer-to-peer (bank must be online during every transaction)
- Bank can fail
- Bank can delay or censor transactions
- Privacy

The bank can fail

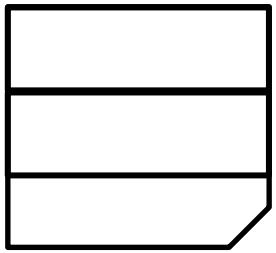
Alice: $10
Bob: $0

Alice

Bob

The bank can delay or censor

E-cash

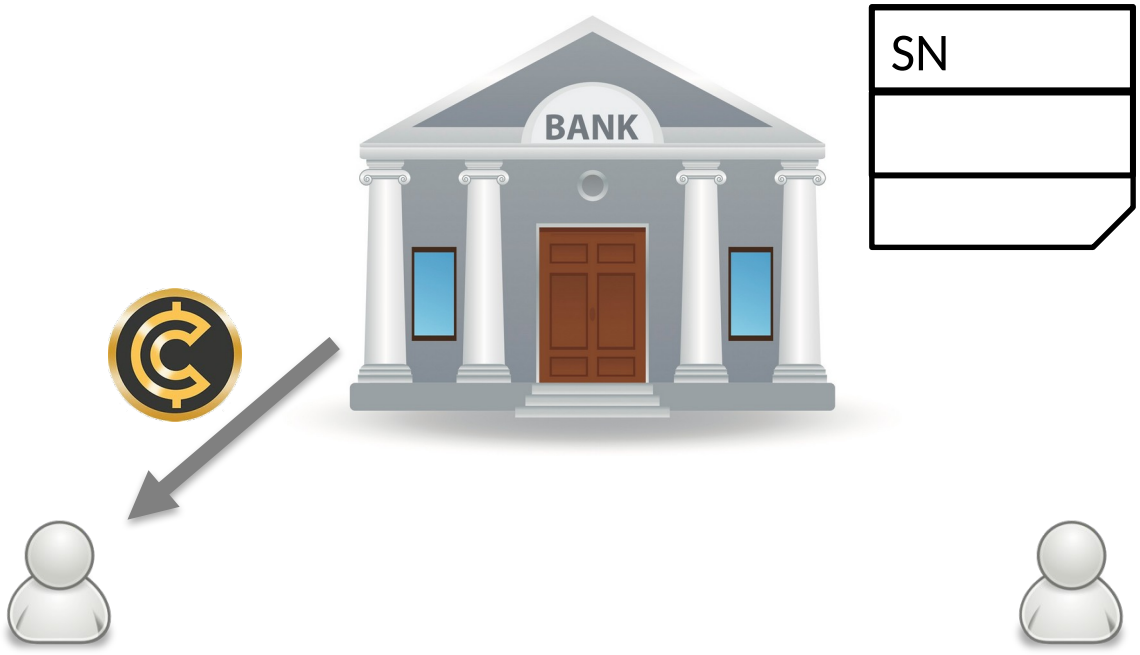


"I, Alice, would like a coin"

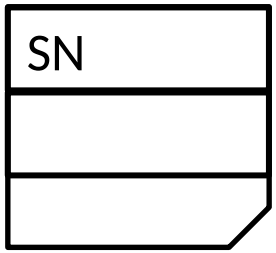
Alice

Bob

E-cash



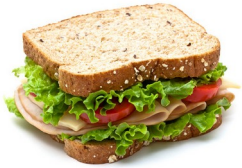
E-cash



E-cash

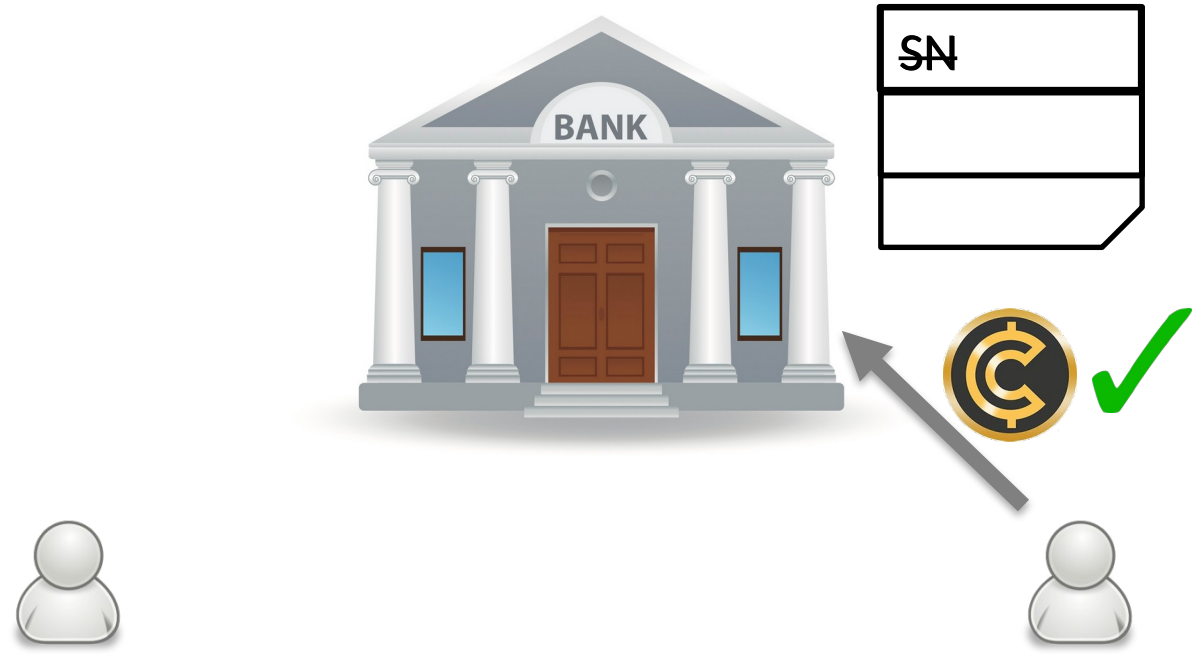
SN

Alice

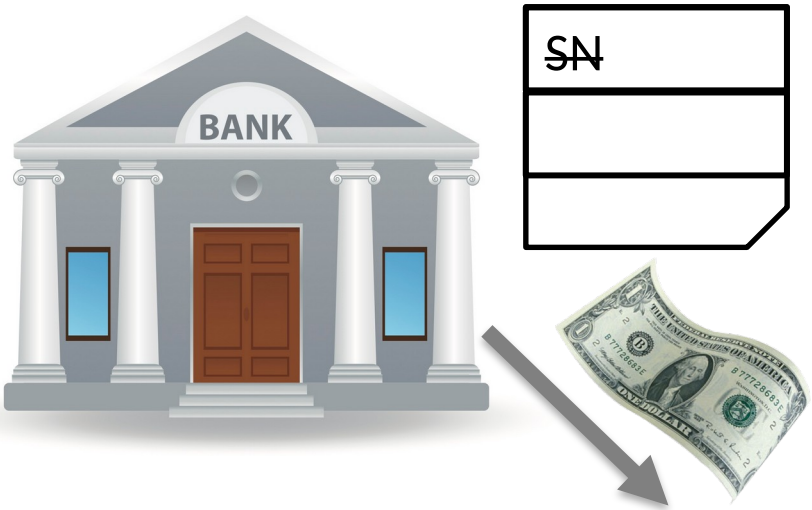


Bob

E-cash



E-cash



Alice

Bob

Pros/cons of simple e-cash

Pros

- Digital payments
- Peer-to-peer

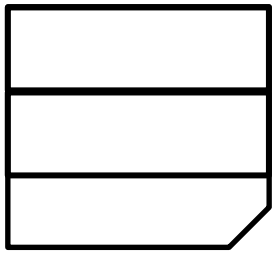
Cons

- Bank needs to be online to verify
- Bank can fail
- Bank can delay or censor transactions
- Privacy

Chaumian e-cash

- Alice can choose SN
- Alice “blinds” her message to the bank so bank can’t see SN
- When Bob redeems, bank doesn’t know payment came from Alice

Chaumian e-cash

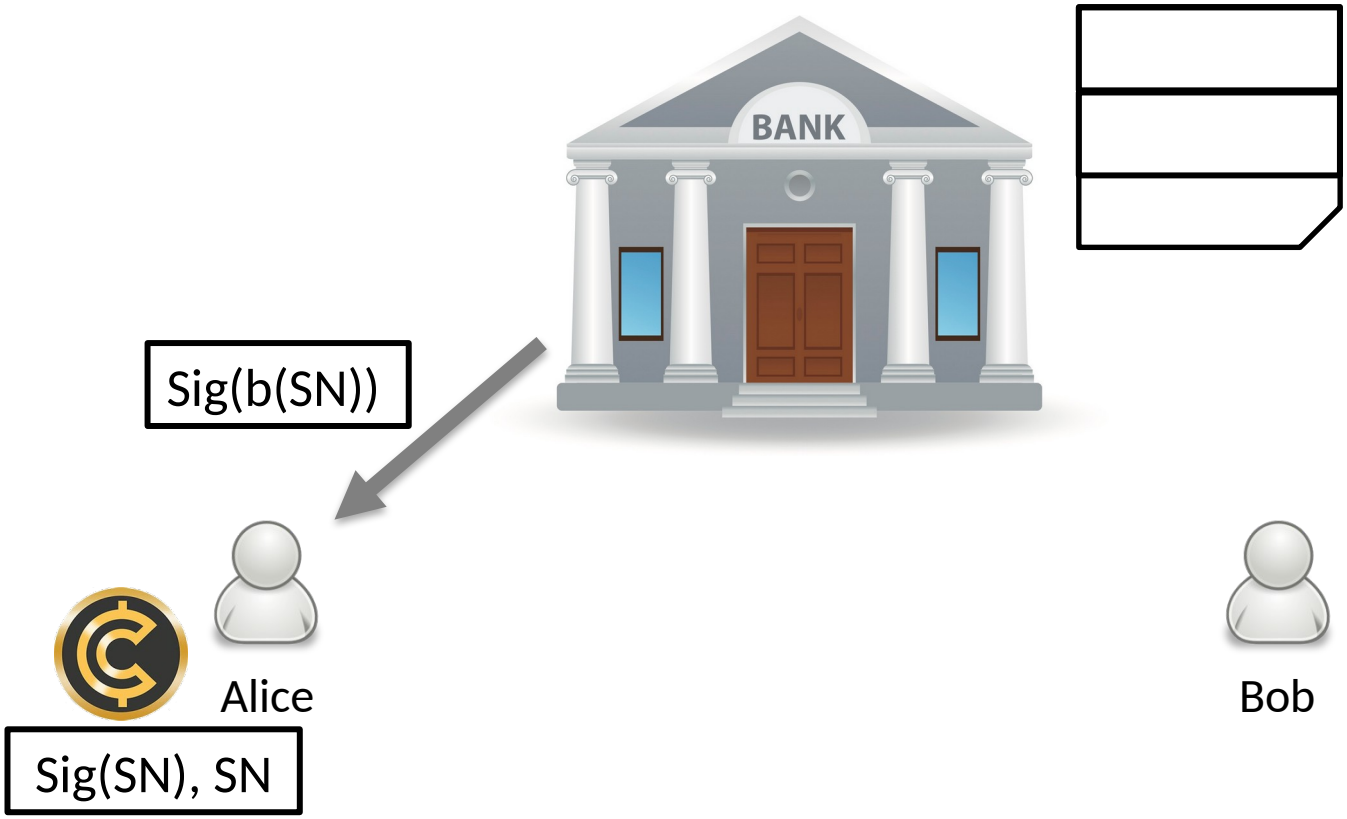


"I, Alice, would like a coin b(SN)"

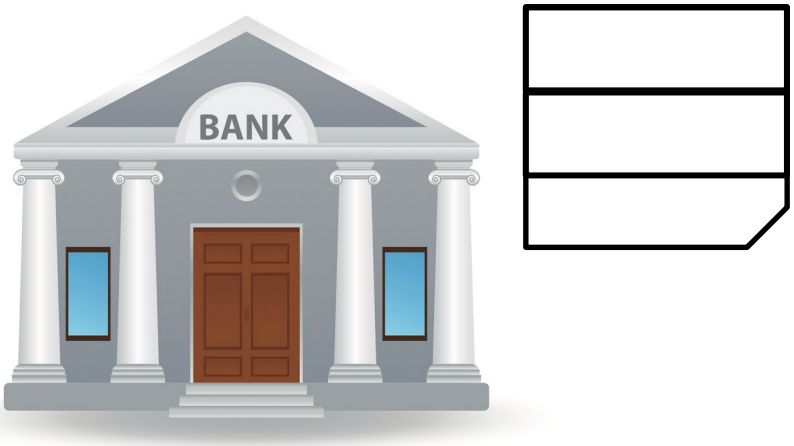
Alice

Bob

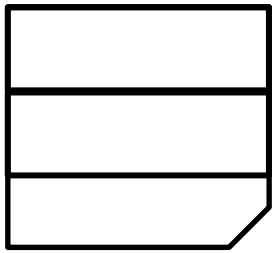
Chaumian e-cash



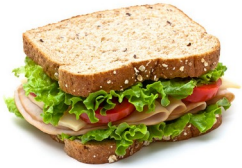
Chaumian e-cash



Chaumian e-cash

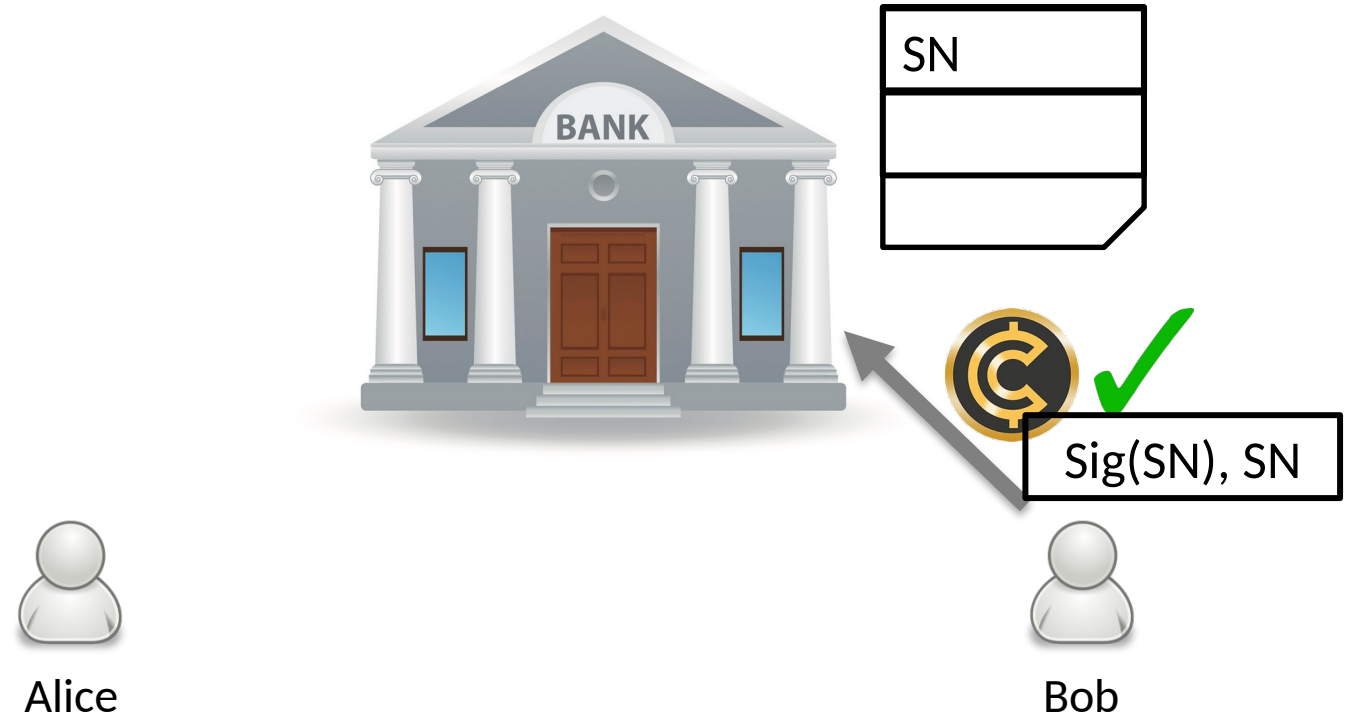


Alice



Bob

Chaumian e-cash



Double spend detection

Pros/cons of Chaumian e-cash

Pros

- Digital payments
- Peer-to-peer
- Privacy
- Offline double-spend detection

Cons

- Bank can censor withdrawals and deposits

How to build decentralized digital token transfer?