



Interledger

Internetworking for Money

Evan Schwartz

Engineer at Ripple

Co-Inventor of Interledger



Payments are **broken.**





Accepting Payments in a Turkish Starbucks

Accepting Payments Online



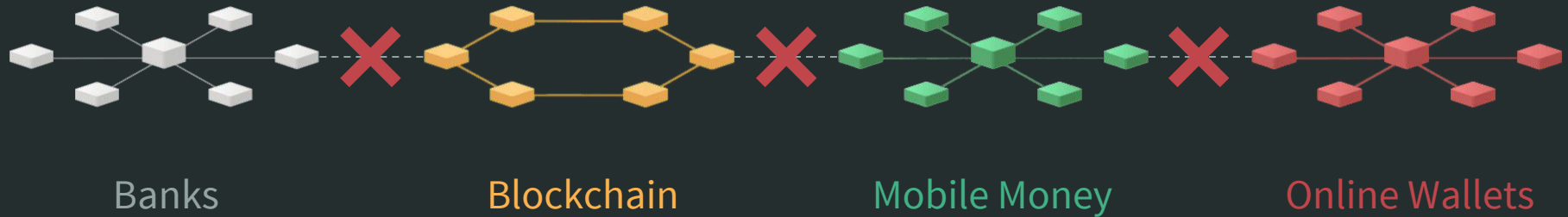
Payment Methods Accepted By Prineta.com





The World Will **Never Agree** On One Ledger

Payment Networks Are Disconnected



Information networks were
disconnected too



Internet



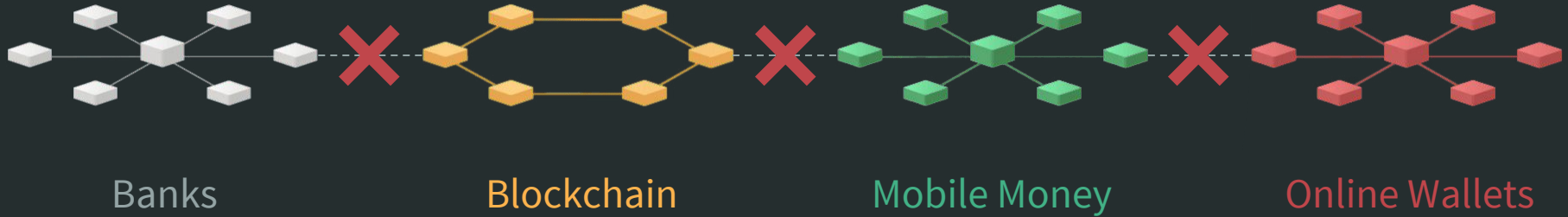
in·ter·net·work·ing

noun

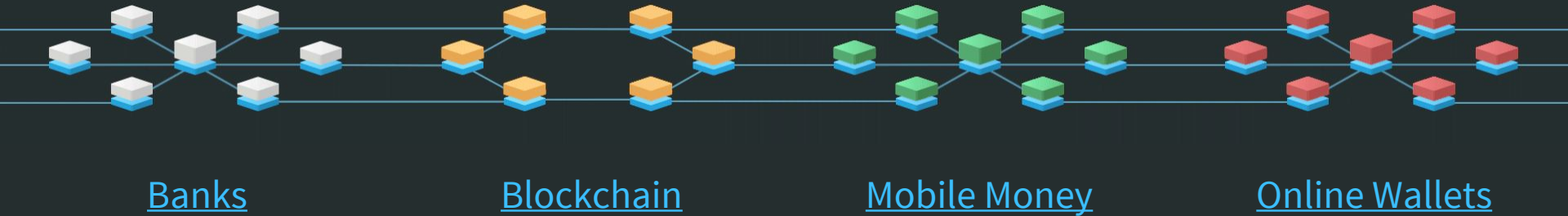
The interconnection of two or more networks so as to form a larger network.



How Do We Fix Payments?



Internetworking For Money





Interledger

The protocol for connecting ledgers



Internetworking Ingredients:

1. Routers
2. Multi-Hop
3. Address + Packet
4. Routing Protocols

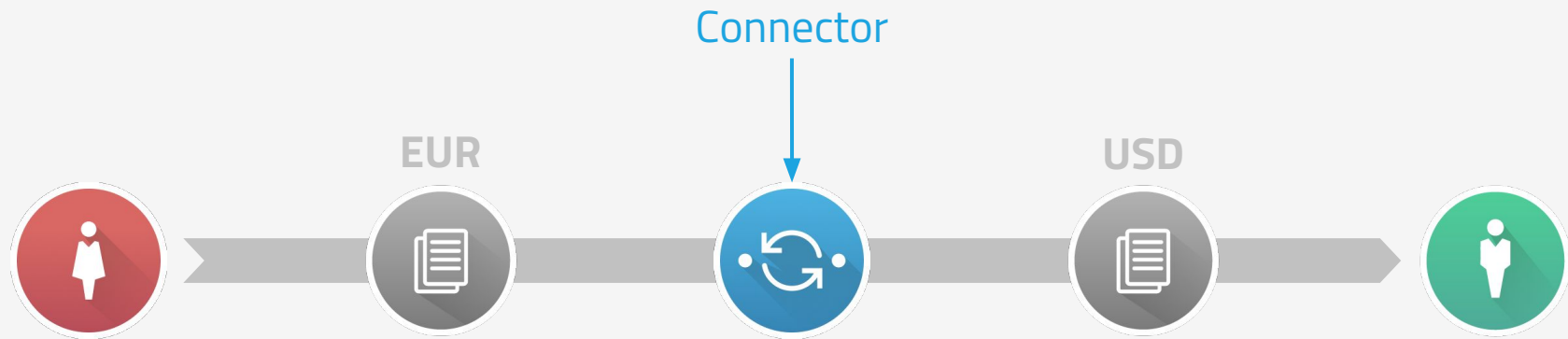


Internetworking Ingredients:

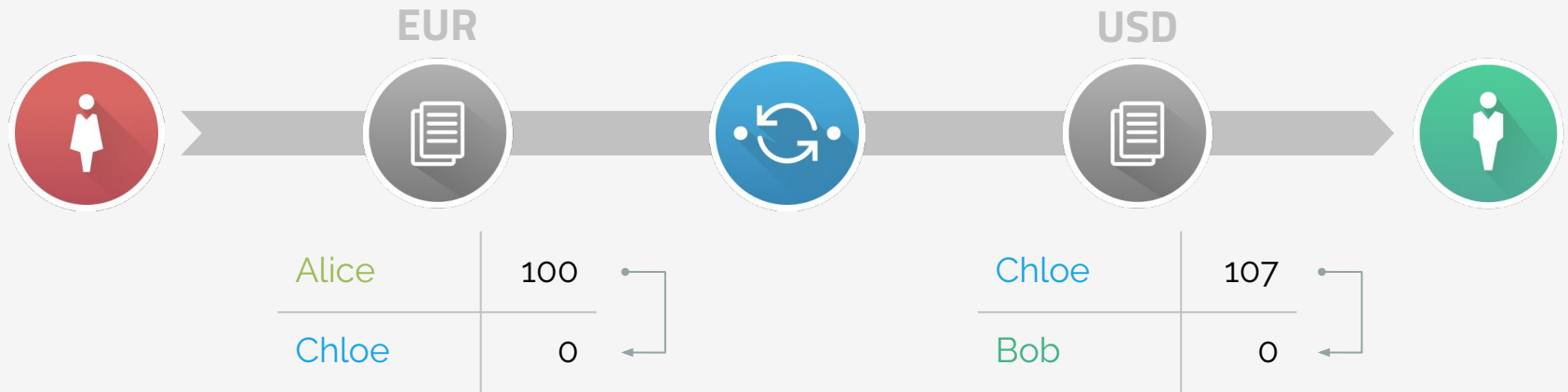
1. Routers
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Connectors Link Two Ledgers



Connectors Exchange Currencies

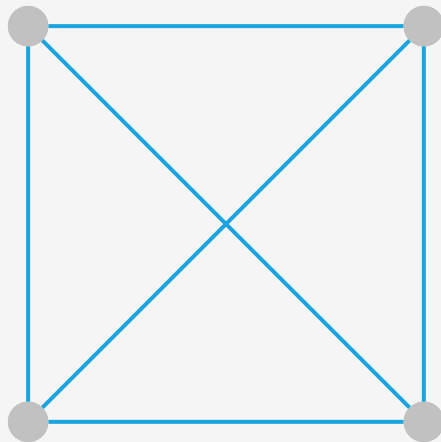


Bilateral Connections Don't Scale



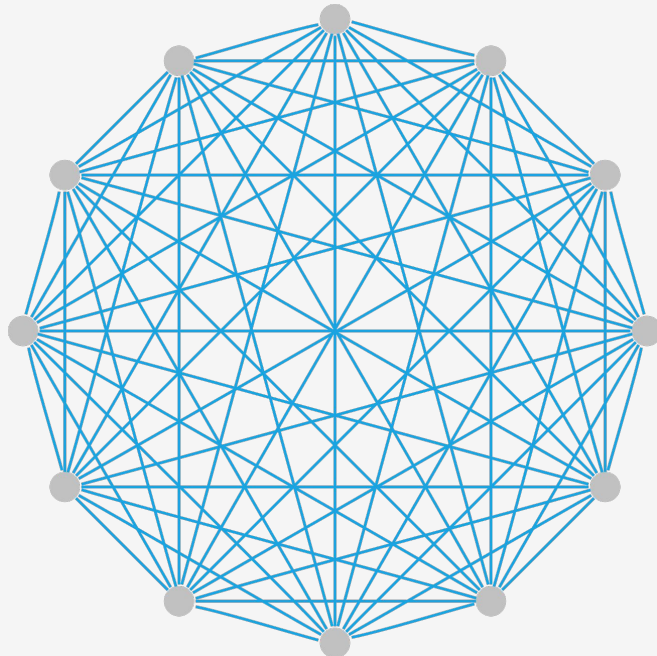
Bilateral Connections Don't Scale

$$O(n^2)$$



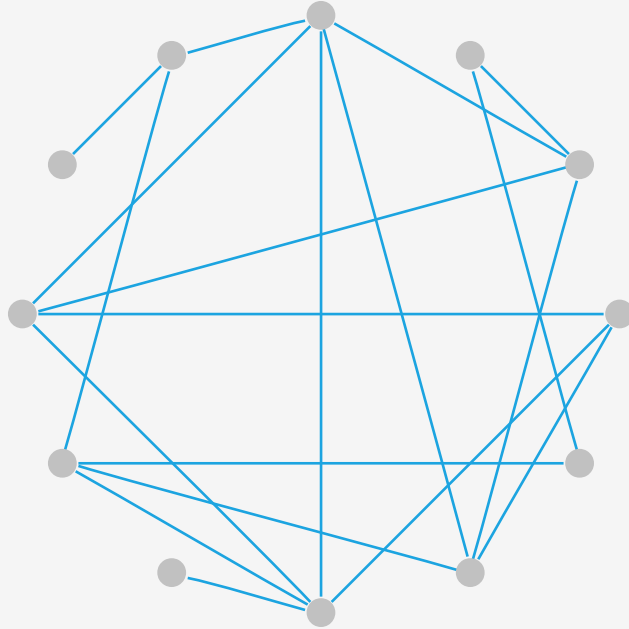
Bilateral Connections Don't Scale

$$O(n^2)$$



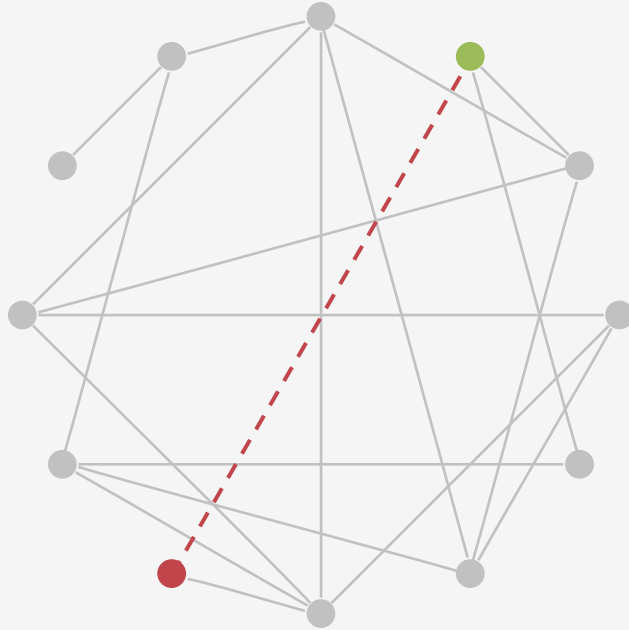
Networks Do Scale

$O(n)$



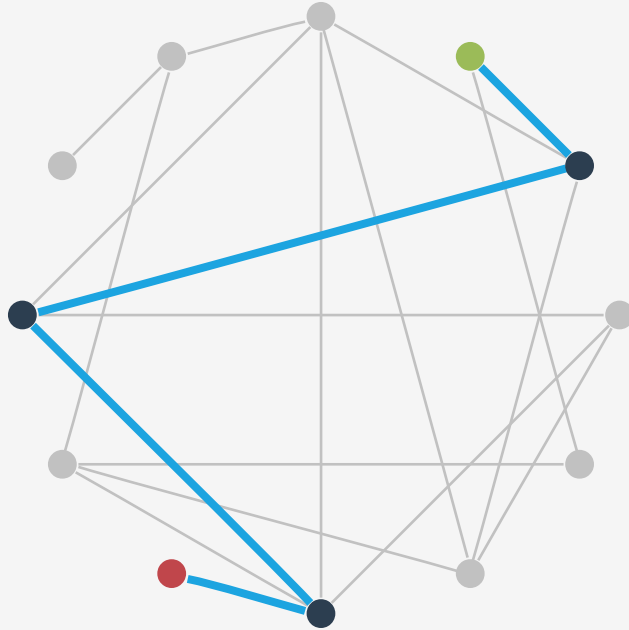
But There Isn't Always A Direct Connection

$O(n)$



We Need Multiple Hops

$O(n)$



Internetworking Ingredients:

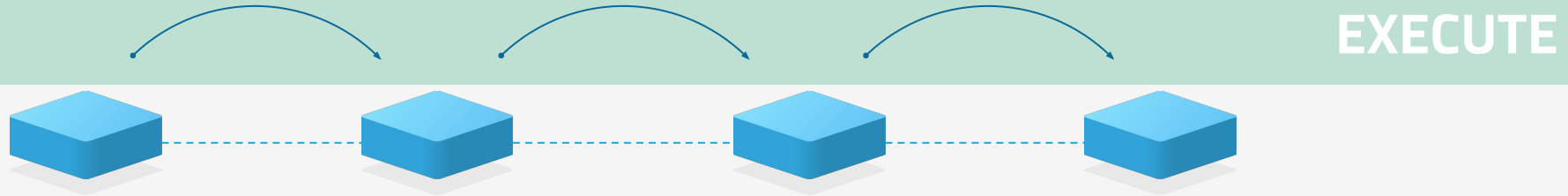
1. Routers
2. Multi-Hop
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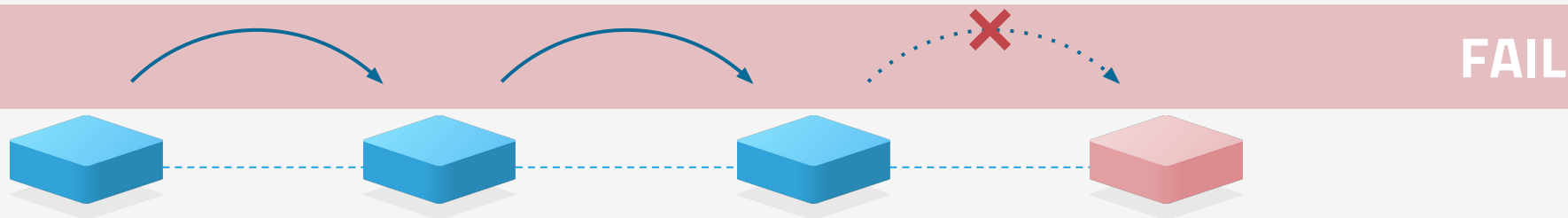
Multi-hop is trickier with
money than with data.



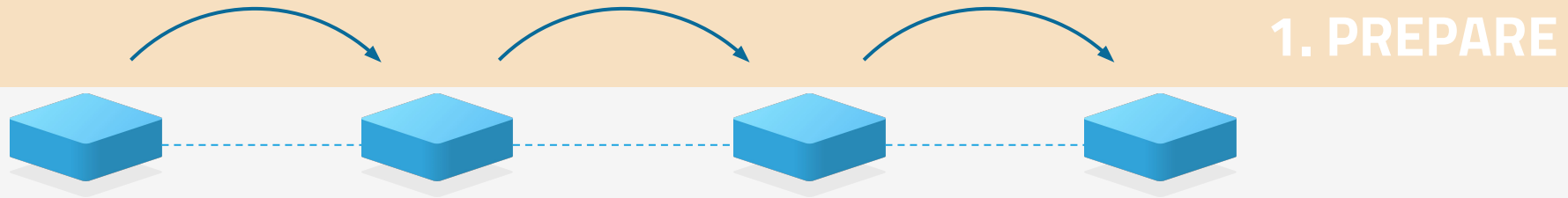
Correspondent Banking: Optimistic Execution



Correspondent Banking: Optimistic Execution



Interledger: Two-Phase Execution Secures Multi-Hop Transfers

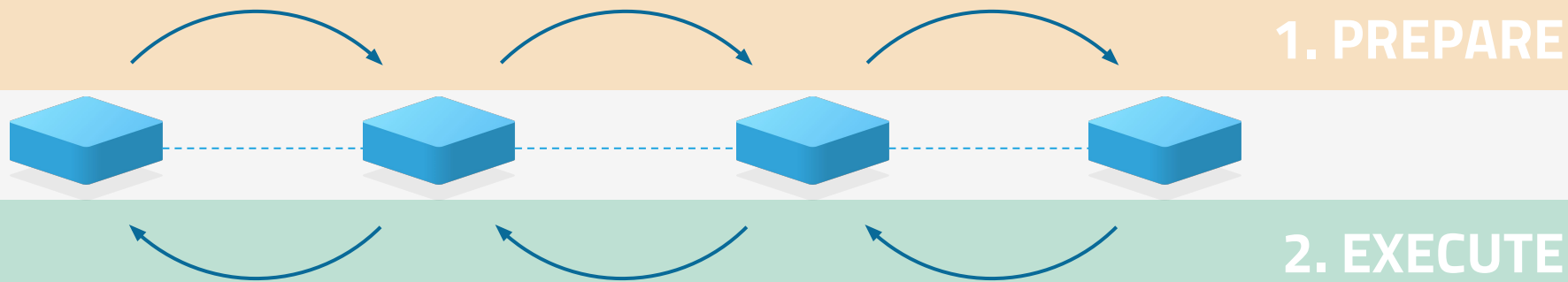


REFERENCES

J. Poon and T. Drya, *The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments*, 2015

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Interledger: Two-Phase Execution Secures Multi-Hop Transfers



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Internetworking Ingredients:

1. Routers
2. Multi-Hop
3. Address + Packet
4. Routing Protocols



Interledger In One Slide

```
{  
  destination_account: "us.usd.chase.bob.car"  
  destination_amount: "5.99"  
}
```



Internetworking Ingredients:

1. Routers
2. Multi-Hop
3. Address + Packet
4. Routing Protocols



Connectors Broadcast Rates to Populate Routing Tables

```
{  
  "ledger": "peer.-vcNd.eur.",  
  "account": "peer.-vcNd.eur.KRixgcBCBd...",  
  "data": {  
    "method": "broadcast_routes",  
    "data": [{  
      "source_ledger": "peer.-vcNd.eur.",  
      "destination_ledger": "peer.oTnBF.usd.",  
      "points": [  
        [0, 0],  
        [100000000, 107195180]  
      ],  
      "min_message_window": 1,  
      "source_account": "peer.-vcNd.eur.Y_luxphkAy..."  
    }]  
  }  
}
```





OUR INSPIRATION

The [History & Architecture](#) of the Internet

Internet Architecture

Application

HTTP SMTP NNTP NTP RTP

Transport

TCP UDP

Internetwork

IP

Network

WIFI BLUETOOTH ETHERNET



Interledger Architecture



Application

SPSP HTTP-ILP PAYTORRENT

Transport

SSP PRP

Interledger

ILP

Ledger

BITCOIN ETHEREUM RIPPLE





Interledger

Internetworking for Money



DEMO








Making an Interledger Payment

The screenshot displays the 'Red' wallet interface in a web browser. The browser's address bar shows 'https://red.ilpdemo.org'. The interface includes a navigation bar with a user profile 'Hi Alice', and links for 'Home', 'Settings', 'API docs', and 'Logout'. The main content area is divided into two sections. On the left, the 'PAYMENT HISTORY' section lists seven transactions, each with a circular profile picture, a description, a timestamp, a monetary value, and a 'STATS' link. The transactions are: 'You paid Alice Cooper' (-\$1.00), 'admin paid you' (+\$1000.00), 'You paid admin' (-\$2.00), 'admin paid you' (+\$1000.00), 'You paid admin' (-\$2.00), 'admin paid you' (+\$1000.00), and 'Alice Cooper paid you' (+\$3.15). On the right, the 'Your Balance' section shows a balance of '\$29910.73*' with a 'Get More' button and a disclaimer. Below this is the 'SEND MONEY' section, which includes input fields for 'RECIPIENT' and 'MESSAGE', and a form to specify the amount to 'YOU SEND' and 'THEY RECEIVE', with a 'Send' button.

Red

Hi Alice Home Settings API docs Logout

PAYMENT HISTORY STATS

	You paid Alice Cooper 2 weeks ago	-\$1.00 1 transfer
	admin paid you Free money 2 weeks ago	+\$1000.00 1 transfer
	You paid admin 2 weeks ago	-\$2.00 1 transfer
	admin paid you Free money 2 weeks ago	+\$1000.00 1 transfer
	You paid admin 2 weeks ago	-\$2.00 1 transfer
	admin paid you Free money 2 weeks ago	+\$1000.00 1 transfer
	Alice Cooper paid you 2 weeks ago	+\$3.15 1 transfer

Your Balance

\$29910.73*

Get More

* Don't get too excited, this is fake money

SEND MONEY

RECIPIENT

MESSAGE

YOU SEND THEY RECEIVE

\$ \$

Send

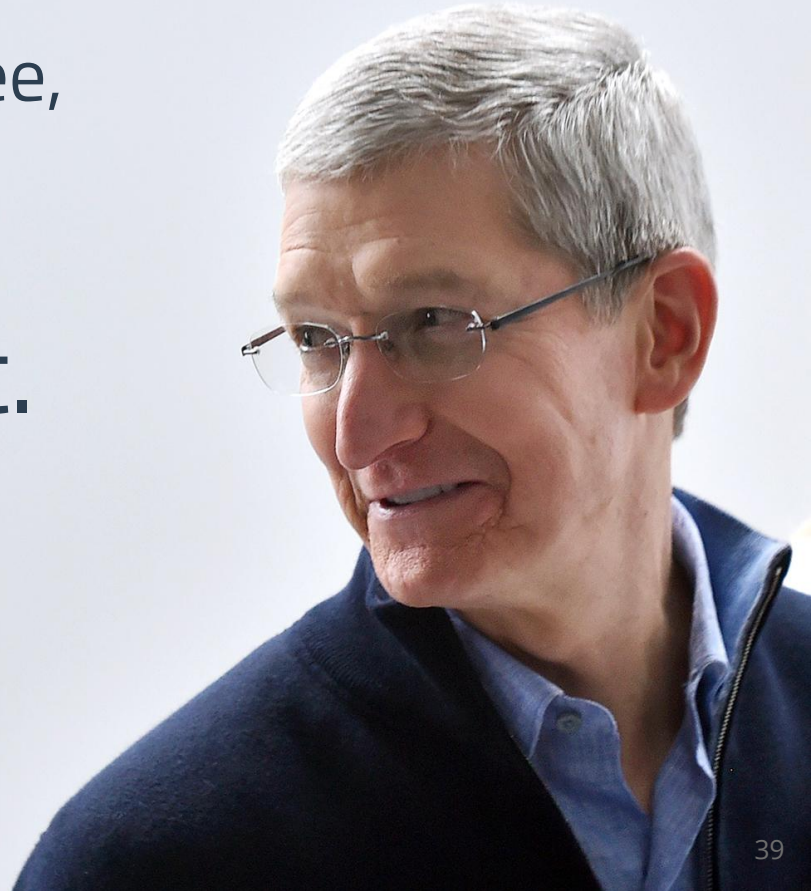
Broken payments are
breaking the Web



When an online service is free,
you're not the customer.

You're the product.

Tim Cook, CEO Apple





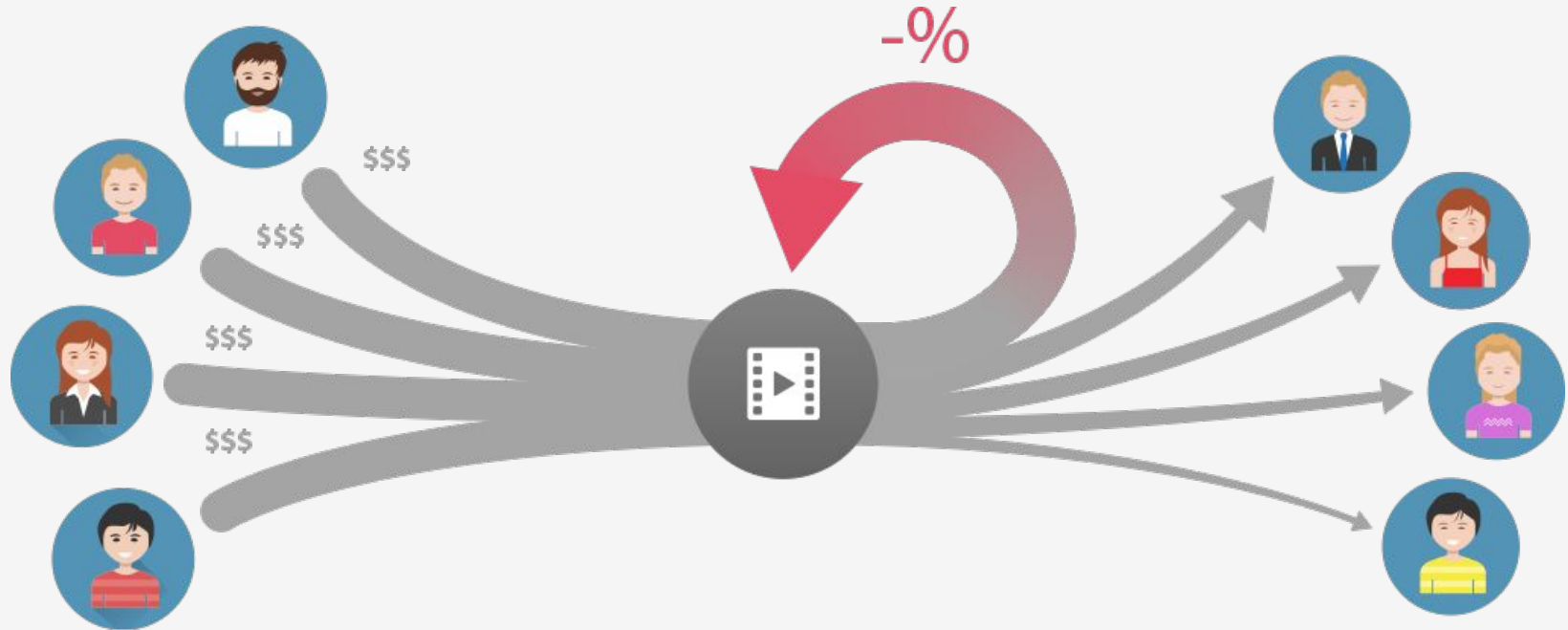
DEAR WIKIPEDIA READERS, We'll get right to it: This week we ask you to help Wikipedia. To protect our independence, we'll never run ads. We're sustained by donations averaging about \$15. Only a tiny portion of our readers give. If everyone reading this right now gave \$3, our fundraiser would be done within an hour. That's right, the price of a cup of coffee is all we need. We're a small non-profit with costs of a top website: servers, staff and programs. Wikipedia is something special. It is like a library or a public park where we can all go to learn. If Wikipedia is useful to you, please take one minute to keep it online and growing. *Thank you.*



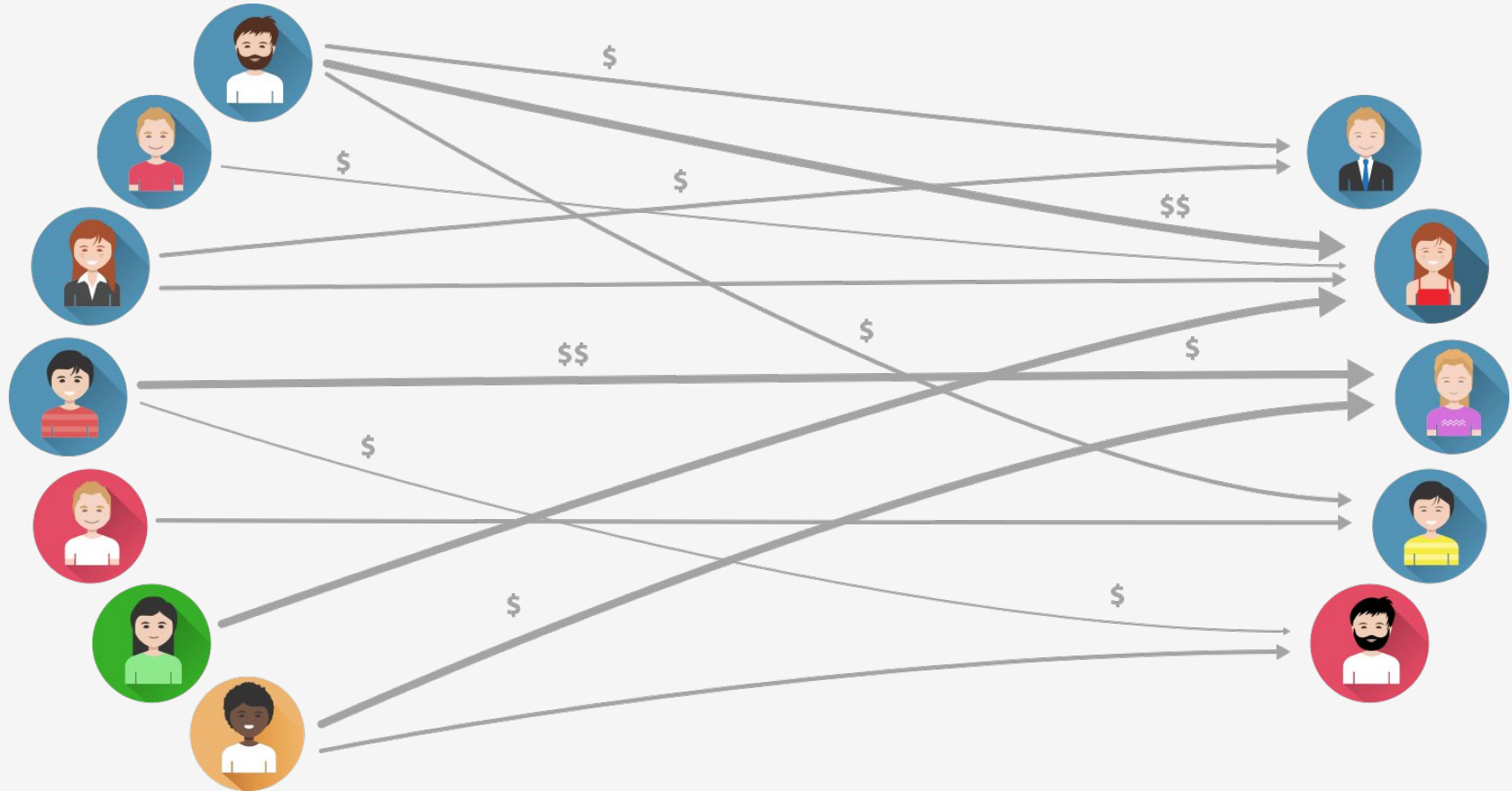


Few Can Convince People to Pay with Credit Cards

Marketplaces Collect Payments, Take Large Cut of Profits



Peer to Peer Model Needs a Neutral (Micro)Payment Protocol





Interledger

Internetworking for Money



Internetworking increases
connectivity and **competition**



Internetworking lowers costs to
enable **new use cases**



Interledger Project

KEY FACTS



Open Protocol



Community Group @ W3C

Banks

Central banks

Payments companies

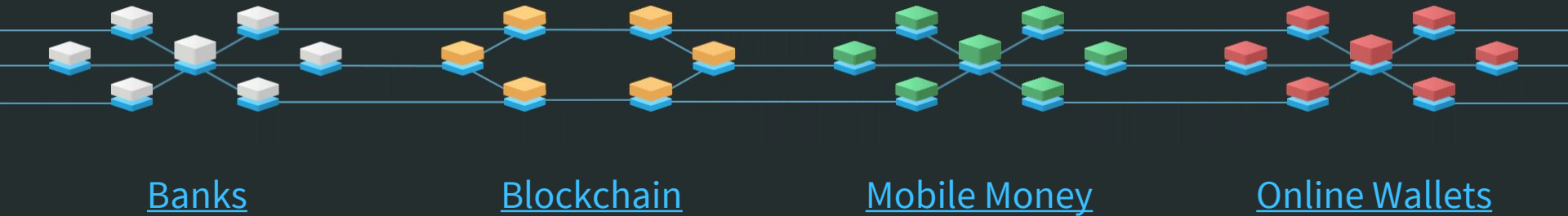
Tech giants

Consulting companies

Blockchain companies

220+ Contributors

Help Us Connect the World's Ledgers!



interledger.org



@interledger

Find Me After to Get an
Interledger Sticker



And To Learn About
"Dial-Up" Interledger