Interledger

Overview

Adrian Hope-Bailie
@ahopebailie
What methods of payment does Airbnb accept?

Payment options may include:

- Major credit cards and pre-paid credit cards (Visa, MasterCard, Amex, Discover, JCB)
- Many debit cards that can be processed as credit
- PayPal for select countries
- Alipay for China only
- Postepay for Italy only
- Sofort Überweisung for Germany only
- iDEAL for the Netherlands only
- Boleto Bancário, Hipercard, Elo, and Aura for Brazil only
- PayU for India only
- Google Wallet for US Android App only
- Apple Pay for iOS App only
Fredrick

*Dar es Salaam, Tanzania*
Money is lost to third parties [...] such as Western Union and SWIFT. It happened to me whereby Airbnb sent $29 and I received only $9.
Money is lost to third parties [...] such as Western Union and SWIFT. It happened to me whereby Airbnb sent $29 and I received only $9.

What is wrong with joining PayPal in Tanzania?
Money is lost to third parties such as Western Union and SWIFT.

It happened to me whereby Airbnb sent $25 and I received only $5.

What is wrong with joining PayPal in Tanzania?

I have a PayPal account. However PayPal is not the same all over the world too. It has "send-only" countries. Tanzania is a send-only country. Which means I can use PayPal to send (spend) money, but I can not receive money (get paid) through PayPal.
I have a PayPal account. However PayPal is not the same all over the world too. It has "send-only" countries. Tanzania is a **send-only country**. Which means I can use PayPal to send (spend) money, but I **cannot receive money** (get paid) through PayPal.

The Airbnb platform is **not really for you** then.
2% of Tanzanians have a bank account

Source: NYU
32% of Tanzanians have a mobile money account

Source: GSMA
The Payment Space is Highly Fragmented
Payment Networks Are Disconnected

- Banks
- Blockchain
- Mobile Money
- Online Wallets
Blockchain Does Not Solve This Problem
Internetworking For Payment Networks

Banks  Blockchain  Mobile Money  Online Wallets
Payments Within One Network Are Trivial

Sender

Ledger

Receiver
Payments Across Ledgers

Sender → Ledger → ? → Ledger → Receiver
Connectors Link Two Ledgers

EUR

Connector

USD
Connectors: Generate Revenue From Spreads

- Alice: 100 EUR
- Chloe: 0 EUR
- Bob: 0 USD
- Chloe: 107 USD
OUR INSPIRATION

The History & Architecture of the Internet
SIMPLICITY
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**
  - IPR
  - PSK
  - PSK-ECDH

- **Interledger**
  - ILP

- **Ledger**
  - BLOCKCHAINS
  - BANKS
  - MOBILE MONEY
This Is Interledger

Amount
Destination
Data
Optimistic Execution
Optimistic Execution

FAIL
1. PREPARE

REFERENCES


Interledger: Two-Phase Execution Secures Multi-Hop Transfers

REFERENCES
This Is Interledger

Amount
Destination
Condition
Expiry
Data
This Is Interledger

- Amount
- Destination
- Condition
- Expiry
- Data

Unitless
This Is Interledger

Amount
Destination
Condition
Expiry
Data

unitless integer
This Is Interledger

Amount
Destination
Condition
Expiry
Data

unitless integer
ex. 1140000000
This Is Interledger

- Amount
- Destination
- Condition
- Expiry
- Data

hierarchical

unitless integer ex. 11400000000
This Is Interledger

- Amount: unitless integer, ex. 1140000000
- Destination: hierarchical, dot-separated
- Condition
- Expiry
- Data
This Is Interledger

- Amount
  - unitless integer
  - ex. 1140000000

- Destination
  - hierarchical dot-separated
  - ex. g.crypto.xrp.r123

- Condition

- Expiry

- Data
This Is Interledger

Amount  Destination  Condition  Expiry  Data

hierarchical dot-separated
ex. g.crypto.xrp.r123

unitless integer
ex. 1140000000

hashlock
<table>
<thead>
<tr>
<th>Amount</th>
<th>Destination</th>
<th>Condition</th>
<th>Expiry</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>This Is Interledger</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unitless integer ex. 11400000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hierarchical dot-separated ex. g.crypto.xrp.r123</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hashlock sha256 ex. jBpj1tiDifo1xBq</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This Is Interledger

Amount

Destination

Condition

Expiry

Data

- Unitless integer: `ex. 1140000000`
- Hashlock: `sha256` `ex. jBpj1tiDifo1xBq`
- Date: `iso-8601` `ex. 2017-11-07T07:11:17Z`
- Hierarchical: `dot-separated` `ex. g.crypto.xrp.r123`
This Is Interledger

Amount
Destination
Condition
Expiry
Data

- **Amount**: unitless integer ex. 1
- **Destination**: hierarchical dot-separated ex. g.cryptocurrency.xrp.r123
- **Condition**: hashlock sha256 ex. jBpj1tiDifo1xBq
- **Expiry**: date iso-8601 ex. 2017-11-07T7:11:17Z
This Is Interledger

**Amount**
- unitless
- integer
- ex. 1140000000

**Destination**
- hierarchical
- dot-separated
- ex. g.crypto.xrp.r123

**Condition**
- hashlock
- sha256
- ex. jBpj1tiDifo1xBQ

**Expiry**
- date
- iso-8601
- ex. 2017-11-07T7:11:17Z

**Data**
- application data
- json, binary, etc.
What Does a Connector Do?

<table>
<thead>
<tr>
<th>Amount</th>
<th>1 140 000 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>g.crypto.xrp.r123</td>
</tr>
<tr>
<td>Condition</td>
<td>jBpj1tiDif0lxBQ</td>
</tr>
<tr>
<td>Expiry</td>
<td>2017-11-07T7:11:17Z</td>
</tr>
<tr>
<td>Data</td>
<td>{ tx_type: &quot;p2p&quot;, ... }</td>
</tr>
</tbody>
</table>
What Does a Connector Do?

**USD** | Exchange Rate | **EUR**
---|---|---
1 140 000 000 | Amount | 1 320 000 000

g.crypto.xrp.r123 | Destination |

jBpj1tiDif0lxBQ | Condition |

2017-11-07T7:11:17Z | Expiry |

{ tx_type: “p2p”, ...} | Data |
What Does a Connector Do?

Exchange Rate & Spread

<table>
<thead>
<tr>
<th>Amount</th>
<th>1 140 000 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>g.crypto.xrp.r123</td>
</tr>
<tr>
<td>Condition</td>
<td>jBpj1tiDif0lxBQ</td>
</tr>
<tr>
<td>Expiry</td>
<td>2017-11-07T7:11:17Z</td>
</tr>
<tr>
<td>Data</td>
<td>{ tx_type: “p2p”, ... }</td>
</tr>
</tbody>
</table>
What Does a Connector Do?

Copy & Route

<table>
<thead>
<tr>
<th>Amount</th>
<th>Destination</th>
<th>Condition</th>
<th>Expiry</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 140 000 000</td>
<td>g.crypto.xrp.r123</td>
<td>jBpj1tiDif0lxBQ</td>
<td>2017-11-07T7:11:17Z</td>
<td>{ tx_type: “p2p”, ... }</td>
</tr>
<tr>
<td>1 300 000 000</td>
<td>g.crypto.xrp.r123</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What Does a Connector Do?

Copy

<table>
<thead>
<tr>
<th>Amount</th>
<th>1 140 000 000</th>
<th>g.crypto.xrp.r123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>jBpj1tiDif0lxBQ</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>2017-11-07T7:11:17Z</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>{ tx_type: &quot;p2p&quot;, ... }</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount</th>
<th>1 300 000 000</th>
<th>g.crypto.xrp.r123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>jBpj1tiDif0lxBQ</td>
<td></td>
</tr>
<tr>
<td>Expiry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What Does a Connector Do?

1 140 000 000   Amount   1 300 000 000

\text{g.crypto.xrp.r123}   Destination   \text{g.crypto.xrp.r123}

jBpj1tiDif0lxBQ   Condition   jBpj1tiDif0lxBQ

2017-11-07T7:11:17Z   Expiry   2017-11-07T7:11:16Z

\{ \text{tx}_\text{type}: \text{“p2p”}, \ldots \}   Data
What Does a Connector Do?

Copy

<table>
<thead>
<tr>
<th>Amount</th>
<th>Destination</th>
<th>Condition</th>
<th>Expiry</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 140 000 000</td>
<td>g.crypto.xrp.r123</td>
<td>jBpj1tiDif0lxBQ</td>
<td>2017-11-07T7:11:17Z</td>
<td>{ tx_type: “p2p”, … }</td>
</tr>
<tr>
<td>1 300 000 000</td>
<td>g.crypto.xrp.r123</td>
<td>jBpj1tiDif0lxBQ</td>
<td>2017-11-07T7:11:16Z</td>
<td>{ tx_type: “p2p”, … }</td>
</tr>
<tr>
<td>Amount</td>
<td>Destination</td>
<td>Condition</td>
<td>Expiry</td>
<td>Data</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>---------------</td>
<td>-------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>1 140 000 000</td>
<td>g.crypto.xrp.r123</td>
<td>jBpj1tiDif0lxBQ</td>
<td>2017-11-07T7:11:17Z</td>
<td>{ tx_type: “p2p”, …}</td>
</tr>
<tr>
<td>1 300 000 000</td>
<td>g.crypto.xrp.r123</td>
<td>jBpj1tiDif0lxBQ</td>
<td>2017-11-07T7:11:16Z</td>
<td>{ tx_type: “p2p”, …}</td>
</tr>
</tbody>
</table>
How to Get Adoption?
Adoption Strategy
Adoption Strategy

Digital assets
e.g. XRP, Ethereum

ILP
Adoption Strategy

- Digital assets: e.g. XRP, Ethereum
- Blockchain: e.g. Hyperledger Quilt

ILP
Adoption Strategy

- Digital assets: e.g. XRP, Ethereum
- Blockchain: e.g. Hyperledger Quilt
- Mobile Money: e.g. Mojaloop
Adoption Strategy

Digital assets
e.g. XRP, Ethereum

Blockchain
e.g. Hyperledger Quilt

Mobile Money
e.g. Mojaloop

Banks
e.g. Ripple

ILP
Adoption Strategy

Digital assets  
- e.g. XRP, Ethereum

Blockchain  
- e.g. Hyperledger Quilt

Mobile Money  
- e.g. MojaLoop

Banks  
- e.g. Ripple

Central Banks  
- e.g. Bank of England

Online wallets

ILP
Adoption Strategy

Micropayments
  e.g. Unhash, Codius

Digital assets
  e.g. XRP, Ethereum

Blockchain
  e.g. Hyperledger Quilt

Mobile Money
  e.g. Mojaloop

Banks
  e.g. Ripple

Central Banks
  e.g. Bank of England

ILP

Online wallets
Adoption Strategy

**Micropayments**
e.g. Unhash, Codius

**Digital assets**
e.g. XRP, Ethereum

**Blockchain**
e.g. Hyperledger Quilt

**Mobile Money**
e.g. Mojalooop

**Banks**
e.g. Ripple

**Central Banks**
e.g. Bank of England

**Web Payments**

**ILP**

**Online wallets**
Adoption Strategy

**Micropayments**
e.g. Unhash, Codius

**Digital assets**
e.g. XRP, Ethereum

**Central Banks**
e.g. Bank of England

**Blockchain**
e.g. Hyperledger Quilt

**Mobile Money**
e.g. MojaLoop

**Banks**
e.g. Ripple

**Web Payments**

**Marketplaces**

**ILP**

**Online wallets**
Q&A

Please join the CG

Adrian Hope-Bailie  https://interledger.org
@ahopebailie