FastPay

High-Performance Byzantine Fault Tolerant Settlement

FastPay

Acknowledgments

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What is FastPay?

A distributed (BFT) system

A standalone system

- An RTGS setting cross-bank payments

A side infrastructure

- Side chain to reduce latency of payments

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A distributed (BFT) system

A standalone system

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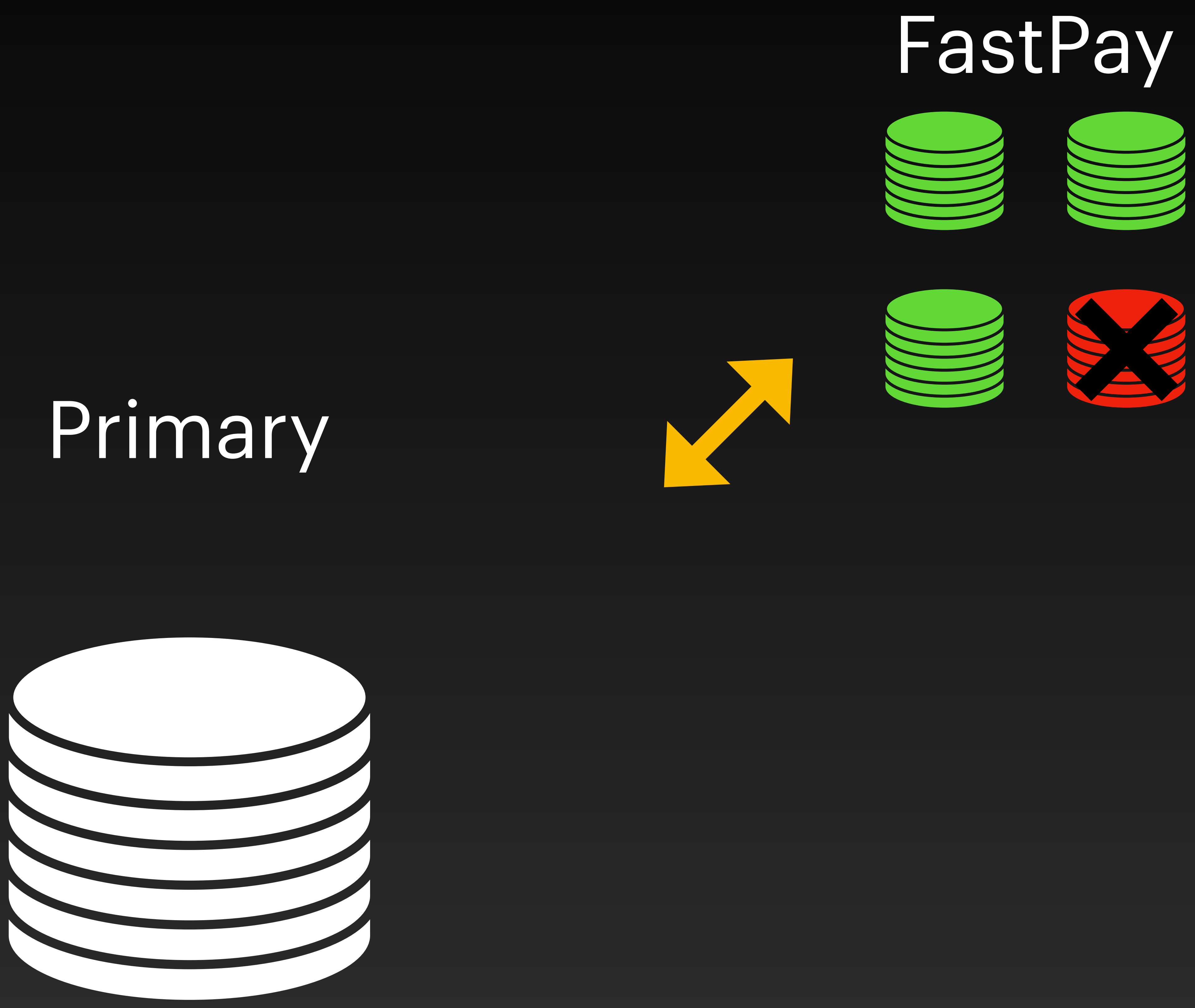
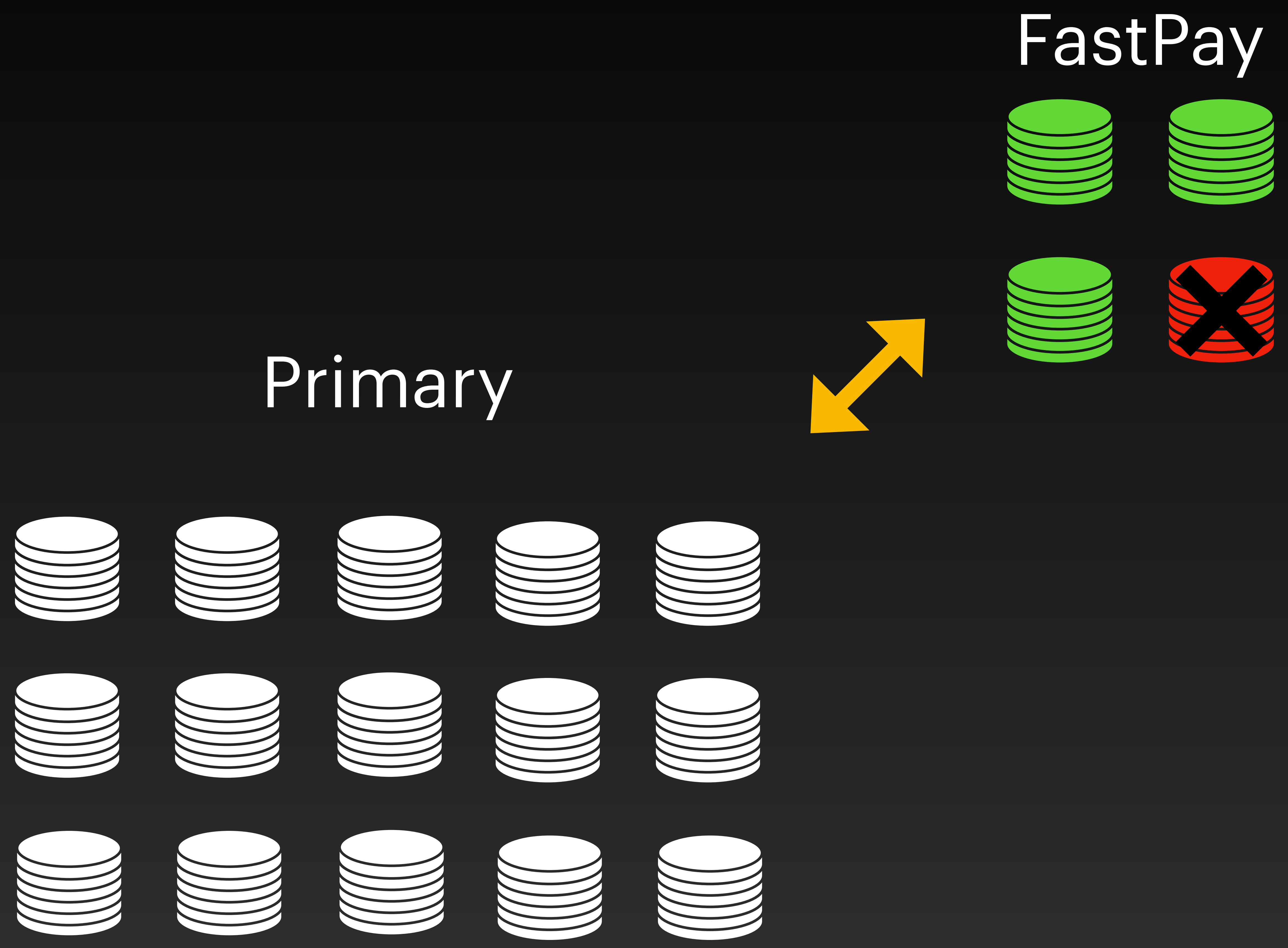
Overview



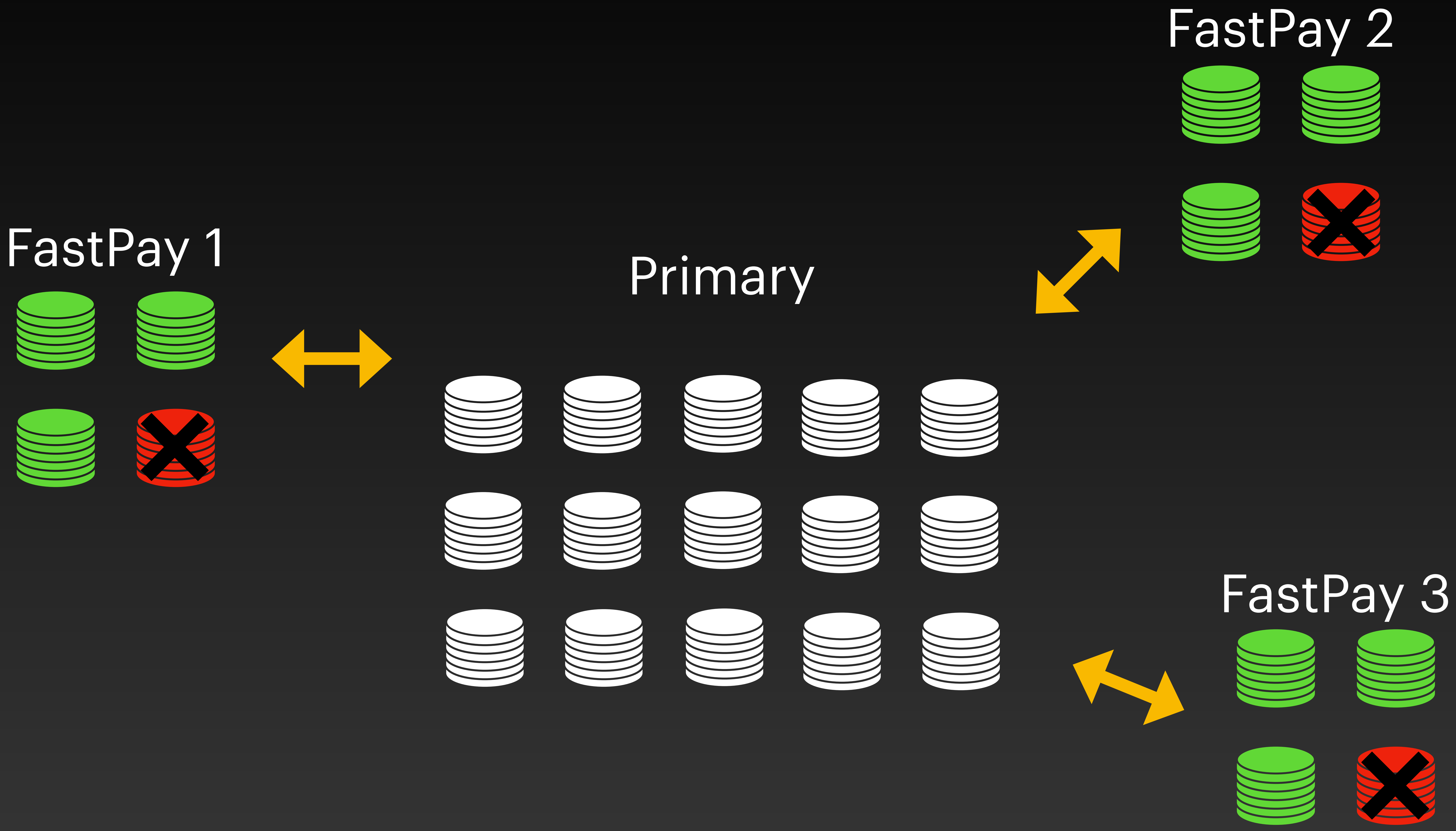
FastPay

Primary

Overview



Overview



Make it practical for retail payment at physical points of sale

This requires extremely low latency

What do we need?

Properties

What we want

- Low latency
- BFT reliance
- Fast finality
- Hight capacity

Current industry

?

Centralized systems

Slow Finality

In summary

What we want

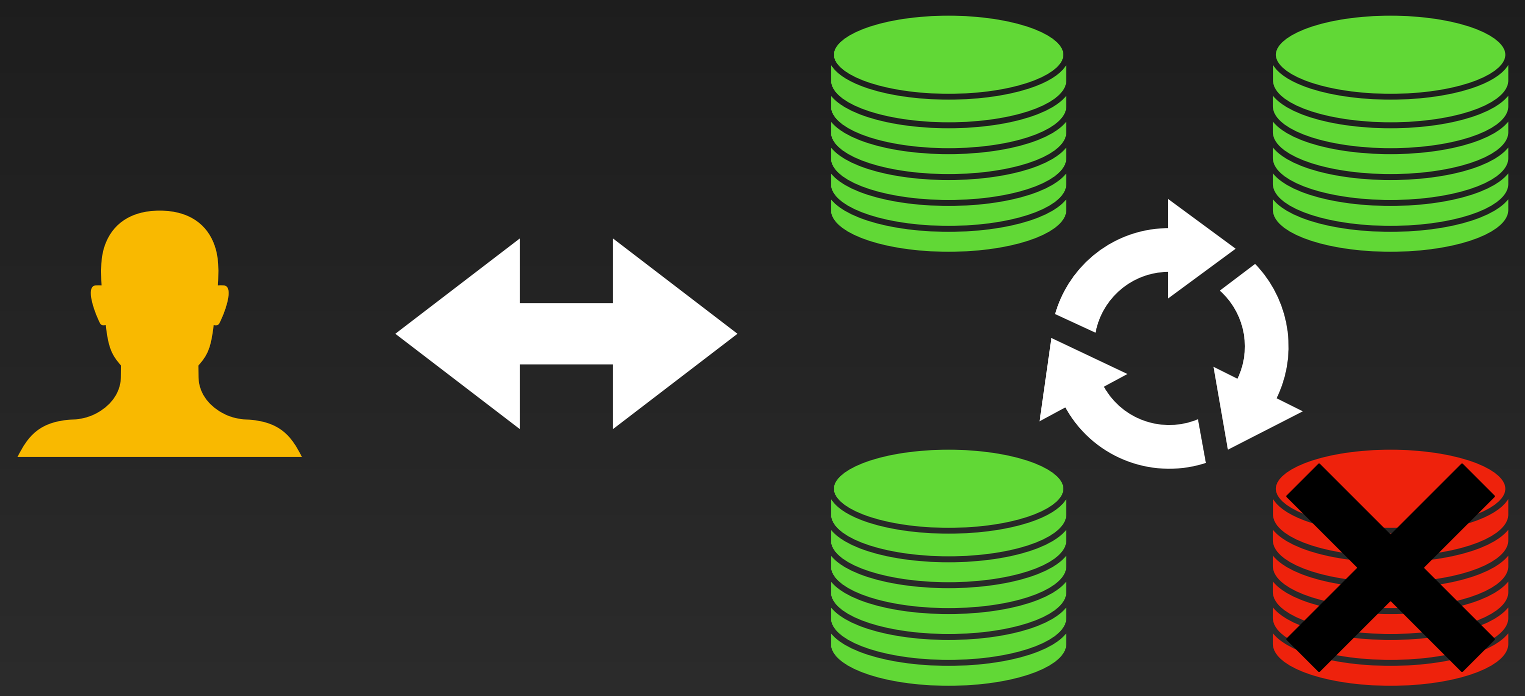
- Low latency
- BFT reliance
- Fast finality
- Hight capacity

Current industry

- Low latency (not settled)
- Centralized
- Slow finality
- Hight capacity (not settled)

Difference with blockchains

Blockchains



Byzantine Consensus

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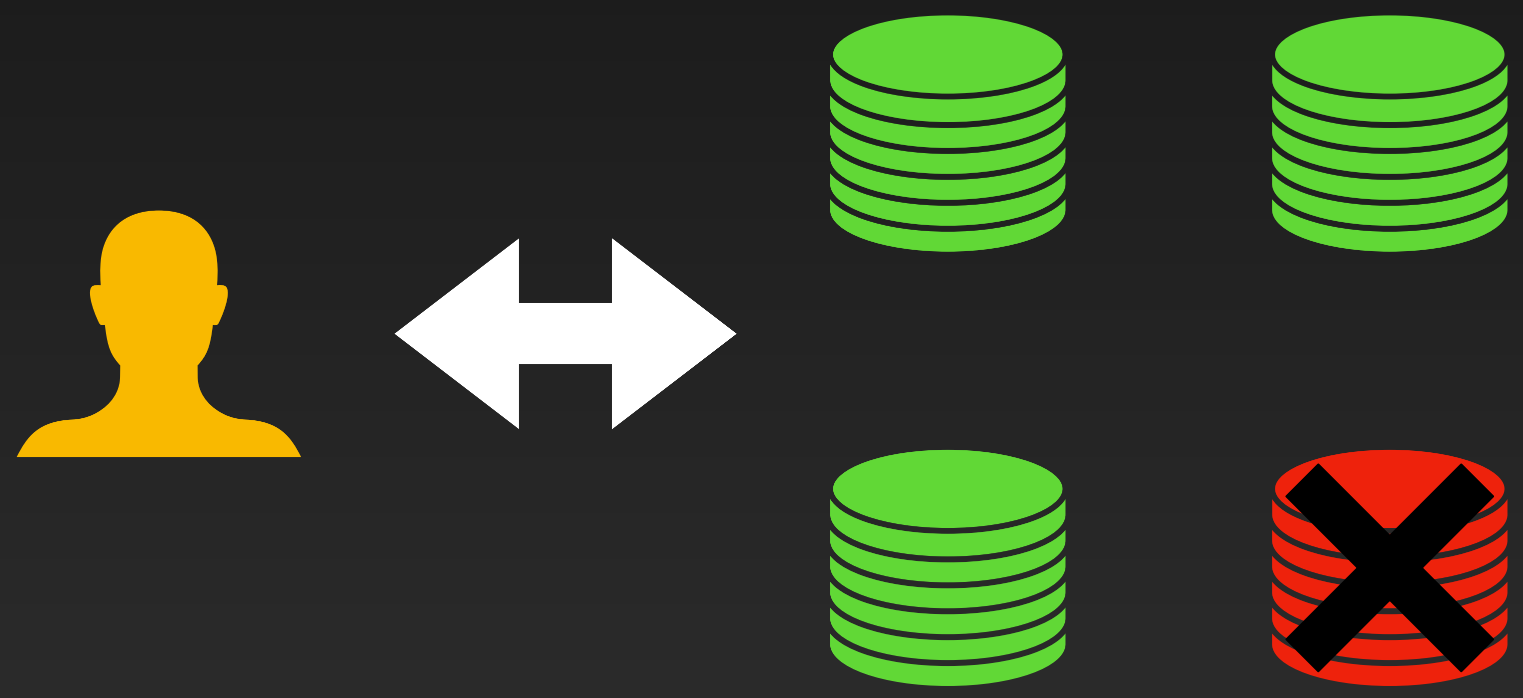

Byzantine Consistent Broadcast

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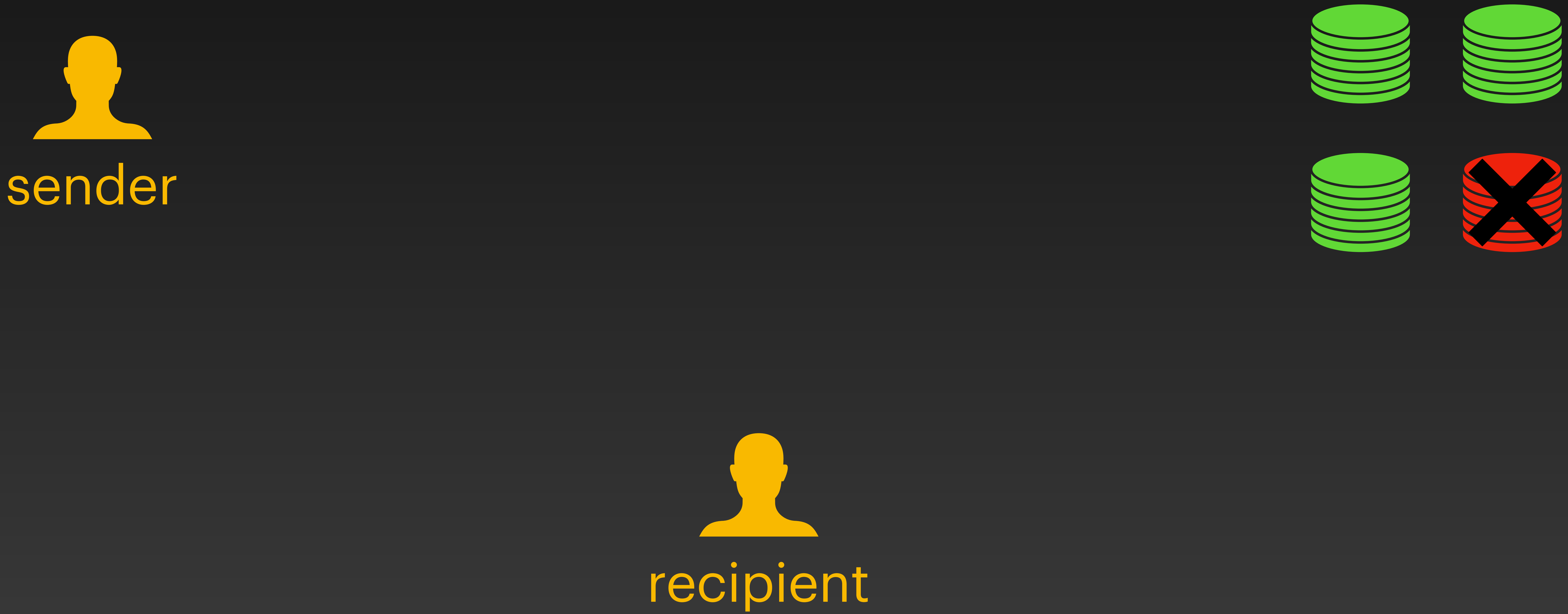
How does it work?



FastPay

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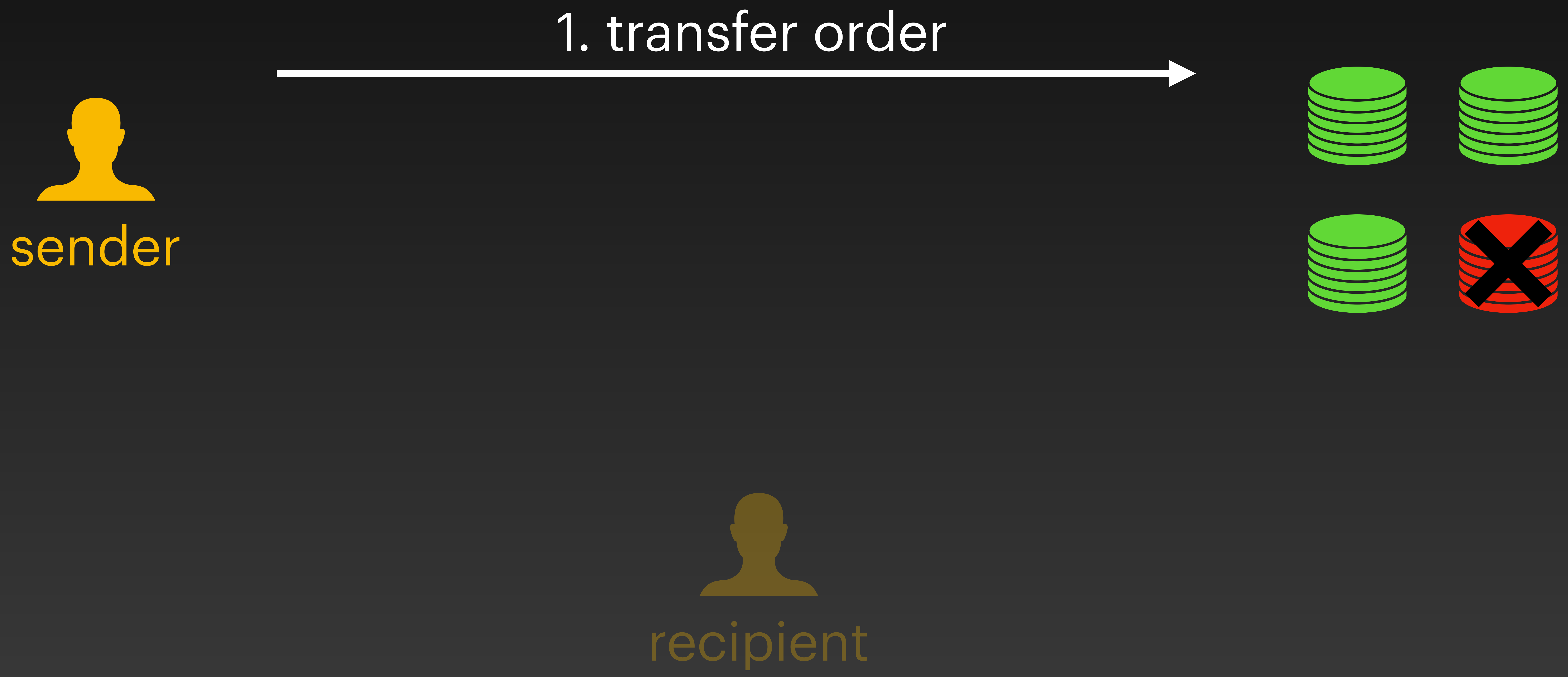


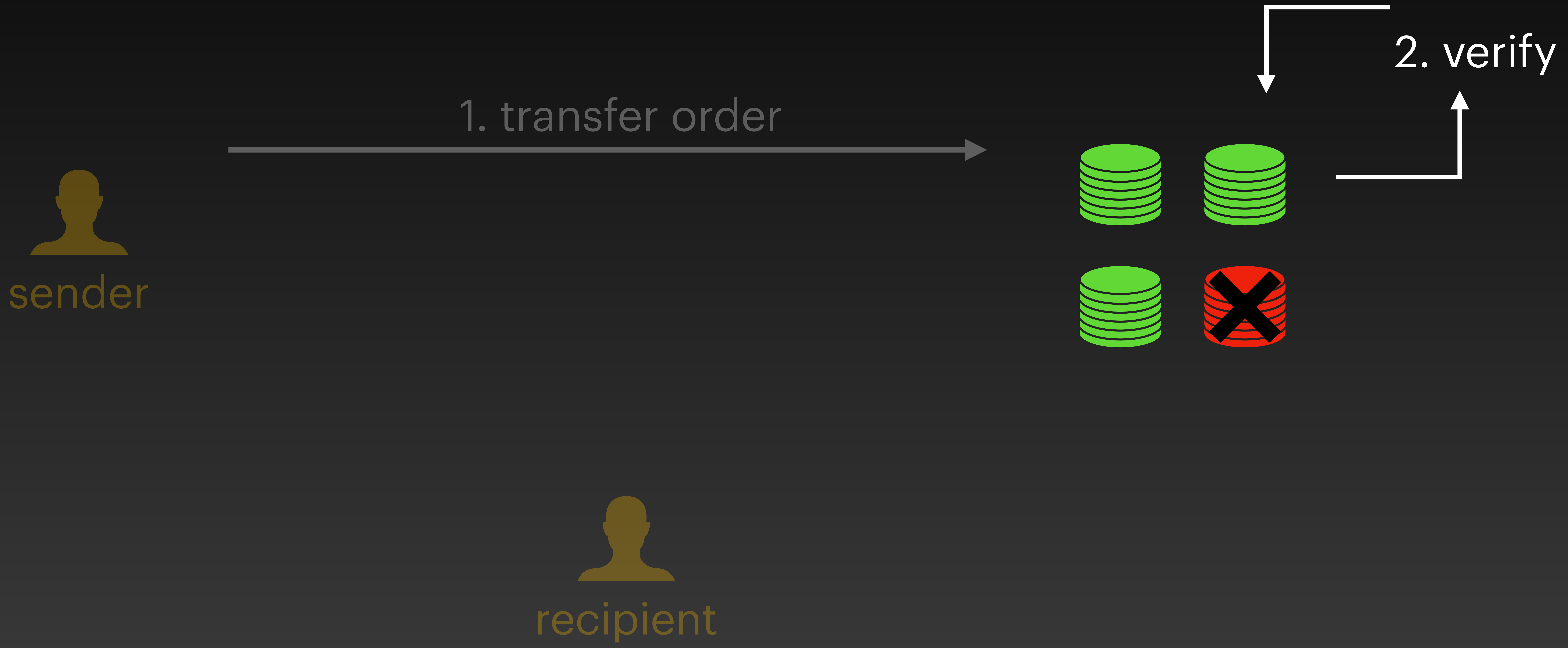
1. transfer order

sender

recipient

FastPay

How does it work?



FastPay

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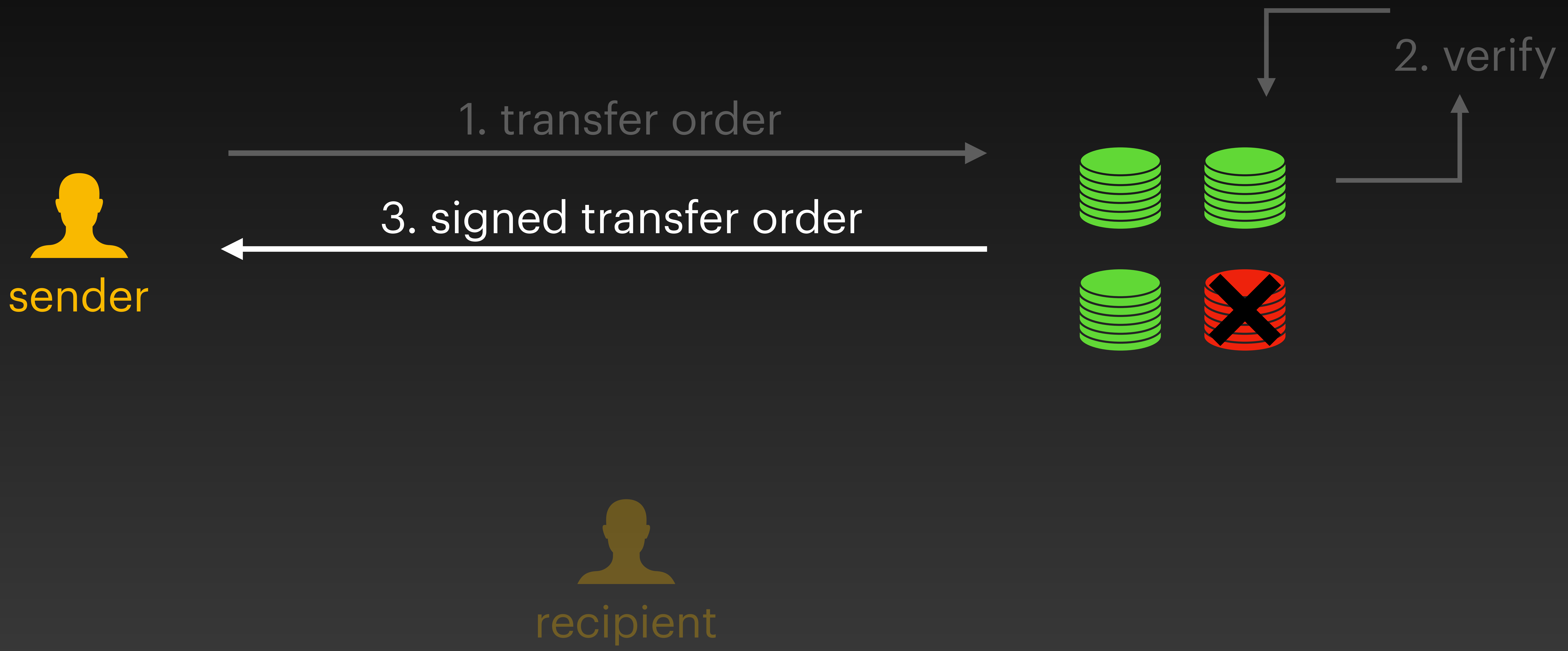


2. verify

1. transfer order

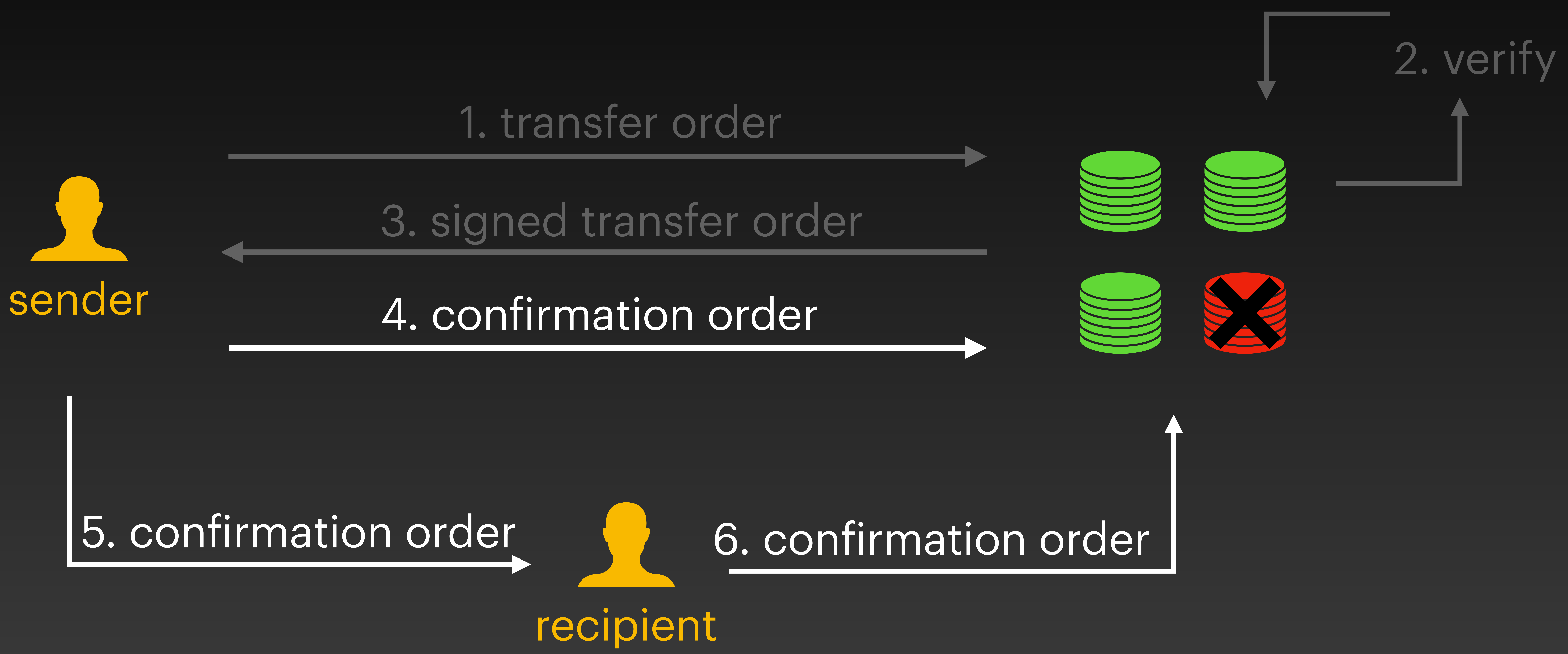
3. signed transfer order

sender

recipient

FastPay

How does it work?



FastPay

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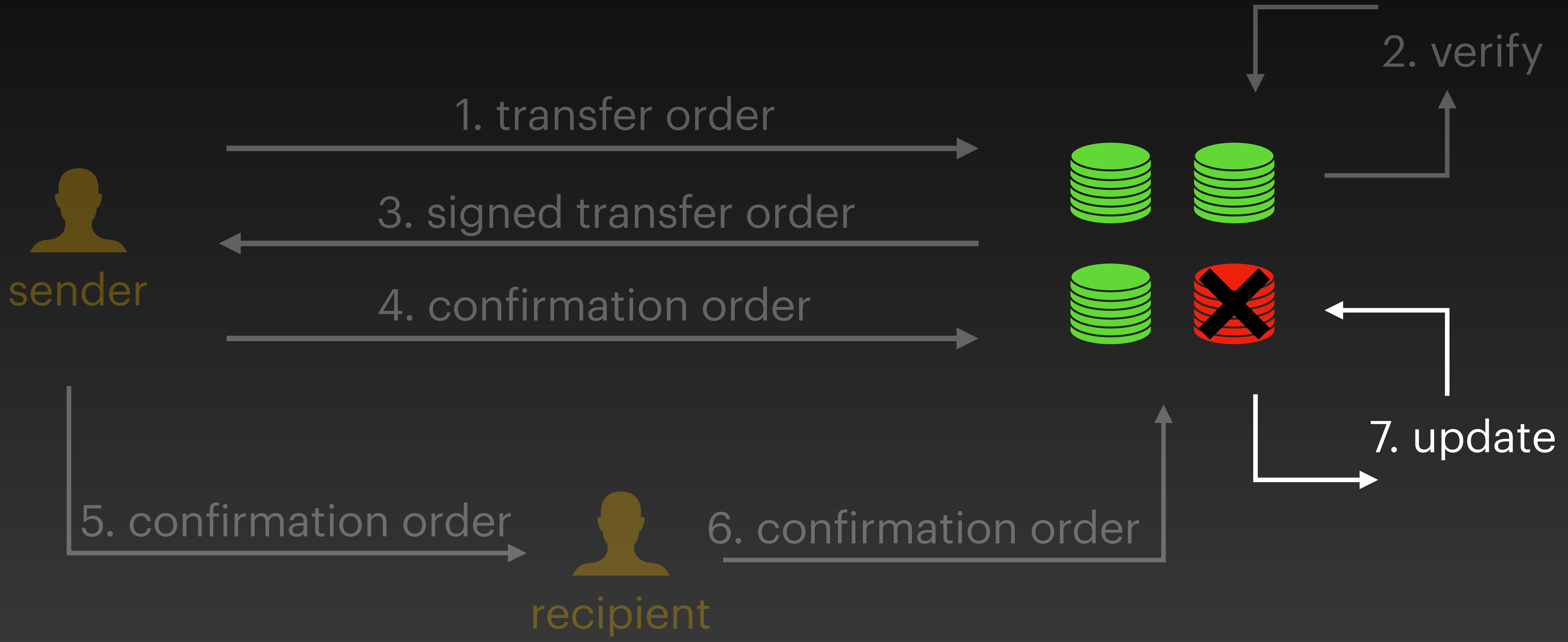

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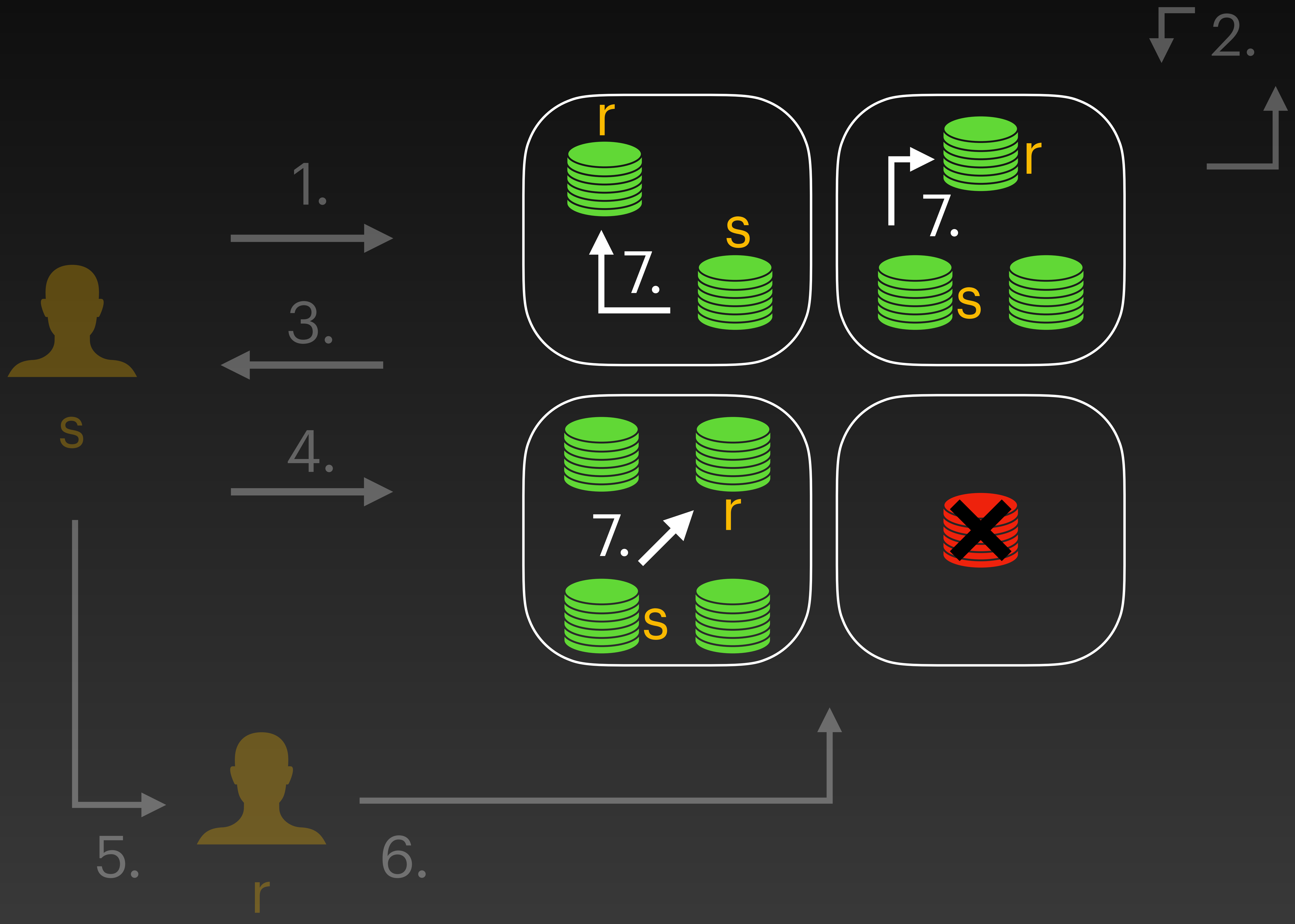
Increasing capacity



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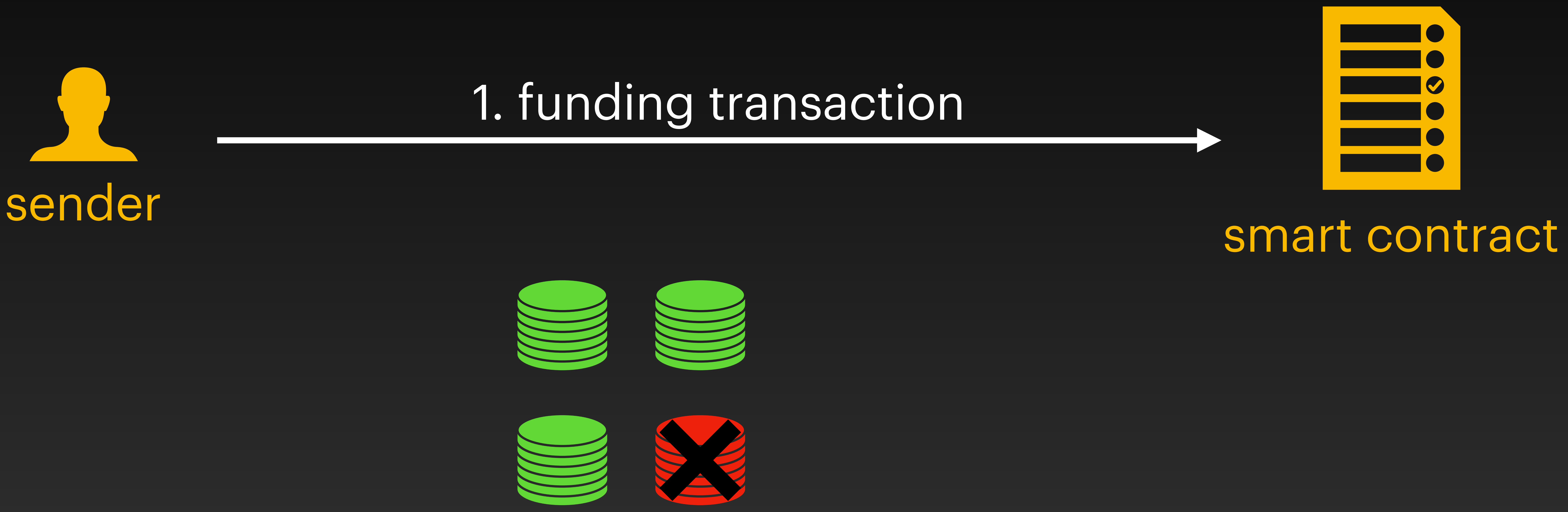
From primary infrastructure to FastPay



FastPay

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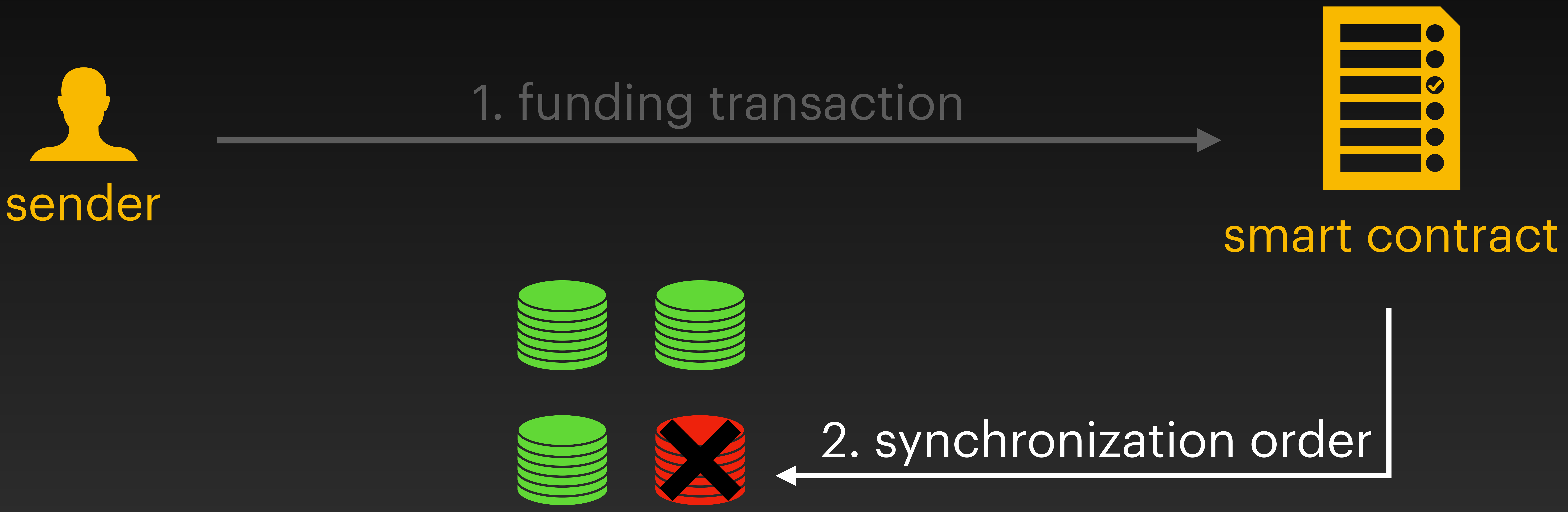


sender

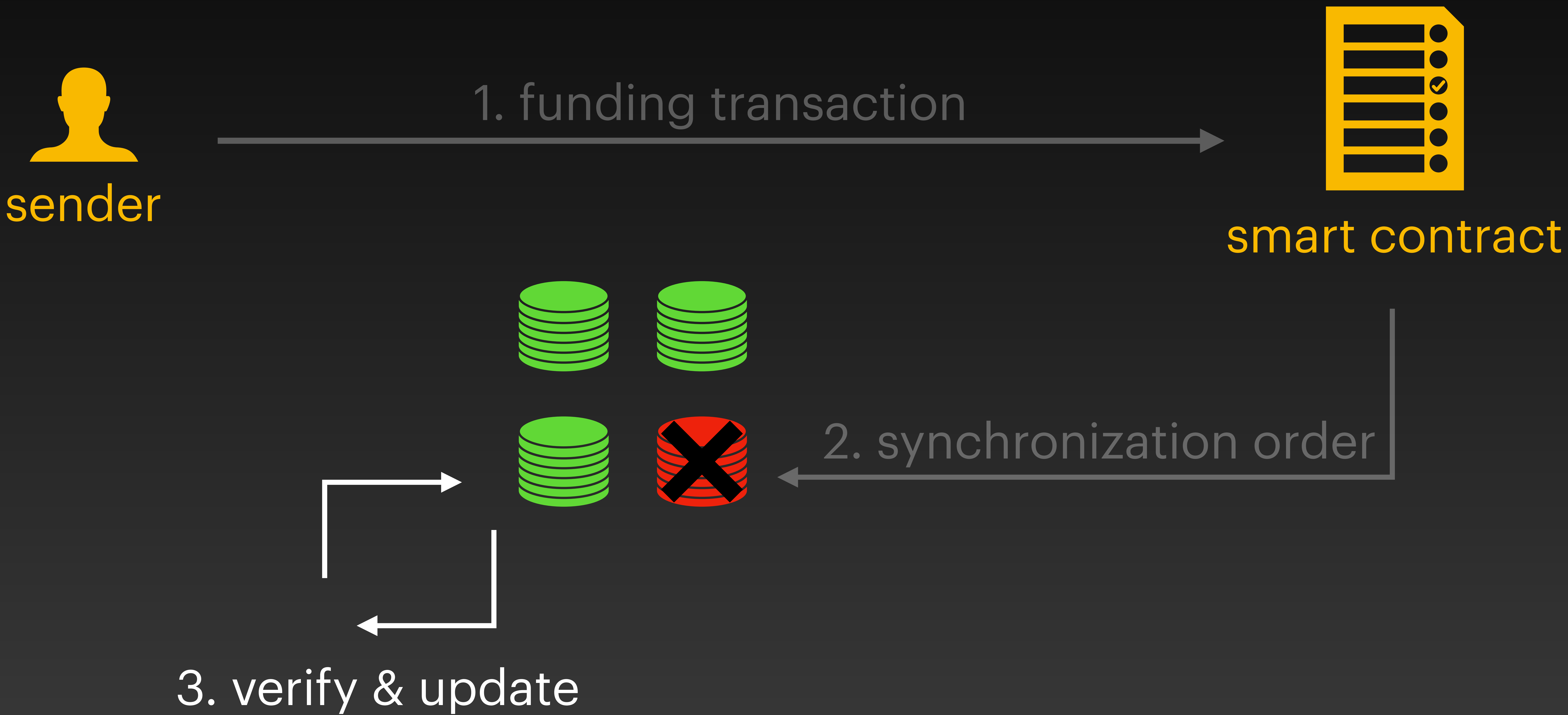
1. funding transaction

smart contract

2. synchronization order

FastPay

From primary infrastructure to FastPay



sender

1. funding transaction

smart contract

2. synchronization order

3. verify & update

FastPay

Implementation

- Written in Rust
- Networking: Tokio & UDP
- Cryptography: ed25519-dalek

https://github.com/novifinancial/fastpay

FastPay

Throughput Evaluation

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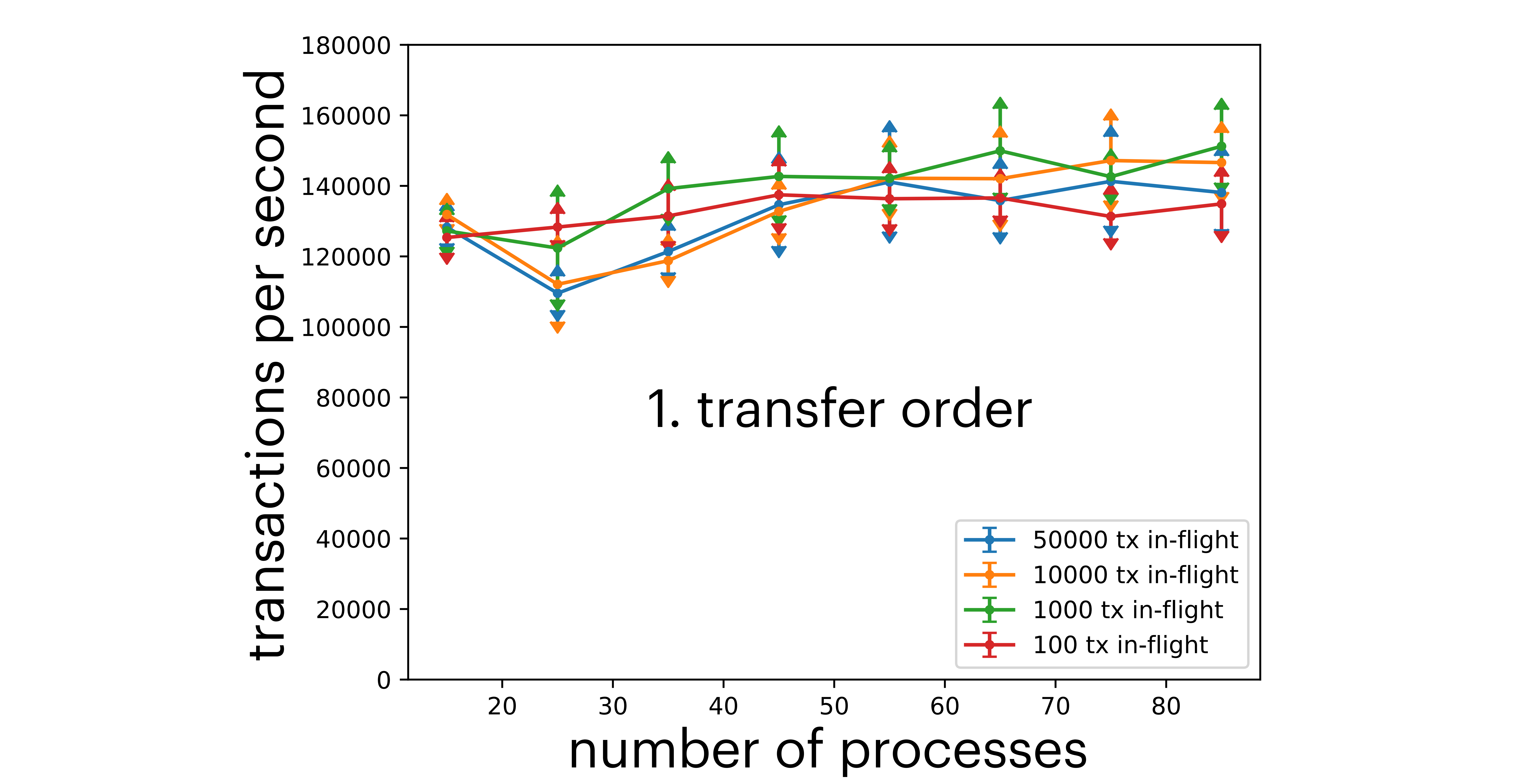
High concurrency



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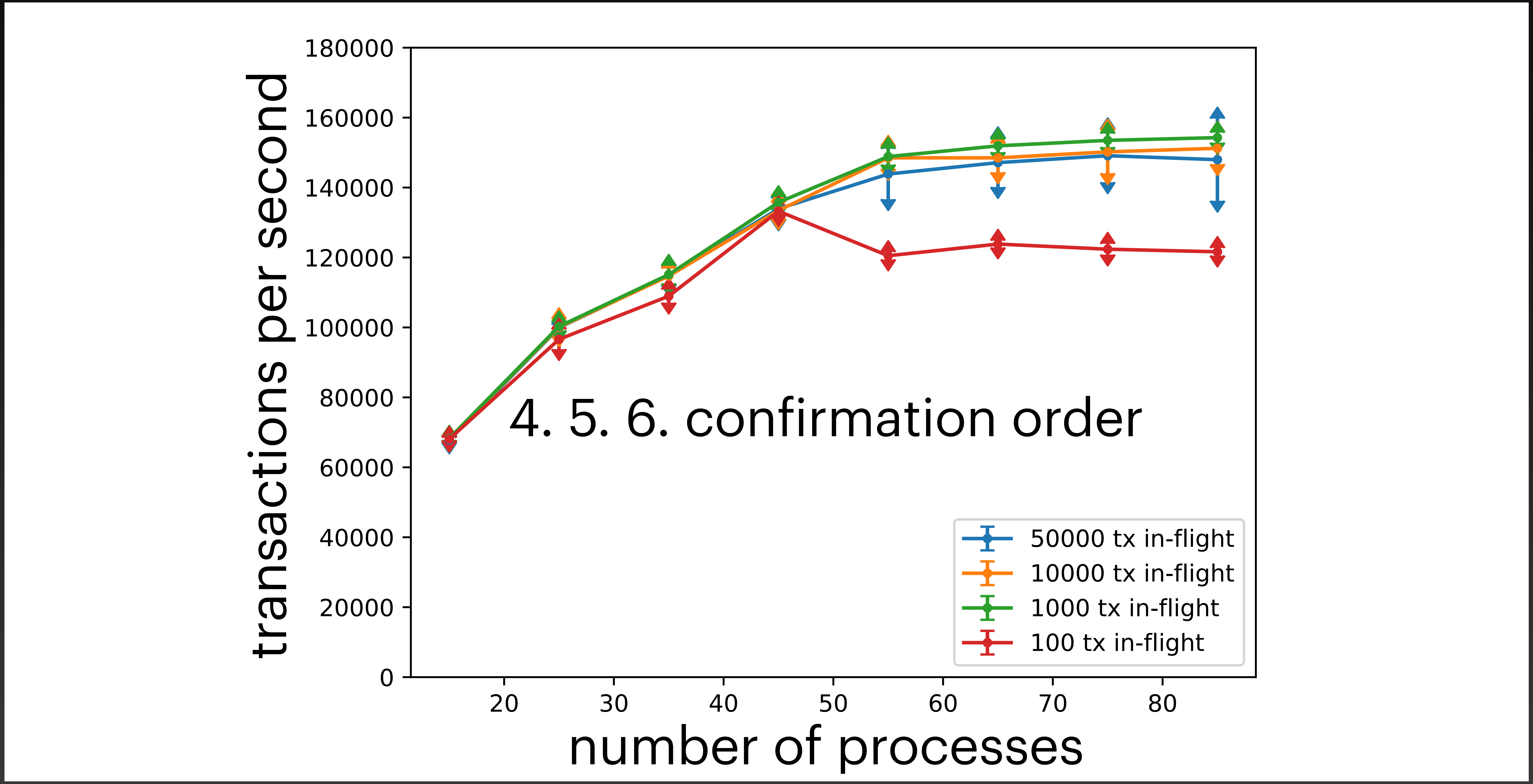
High concurrency



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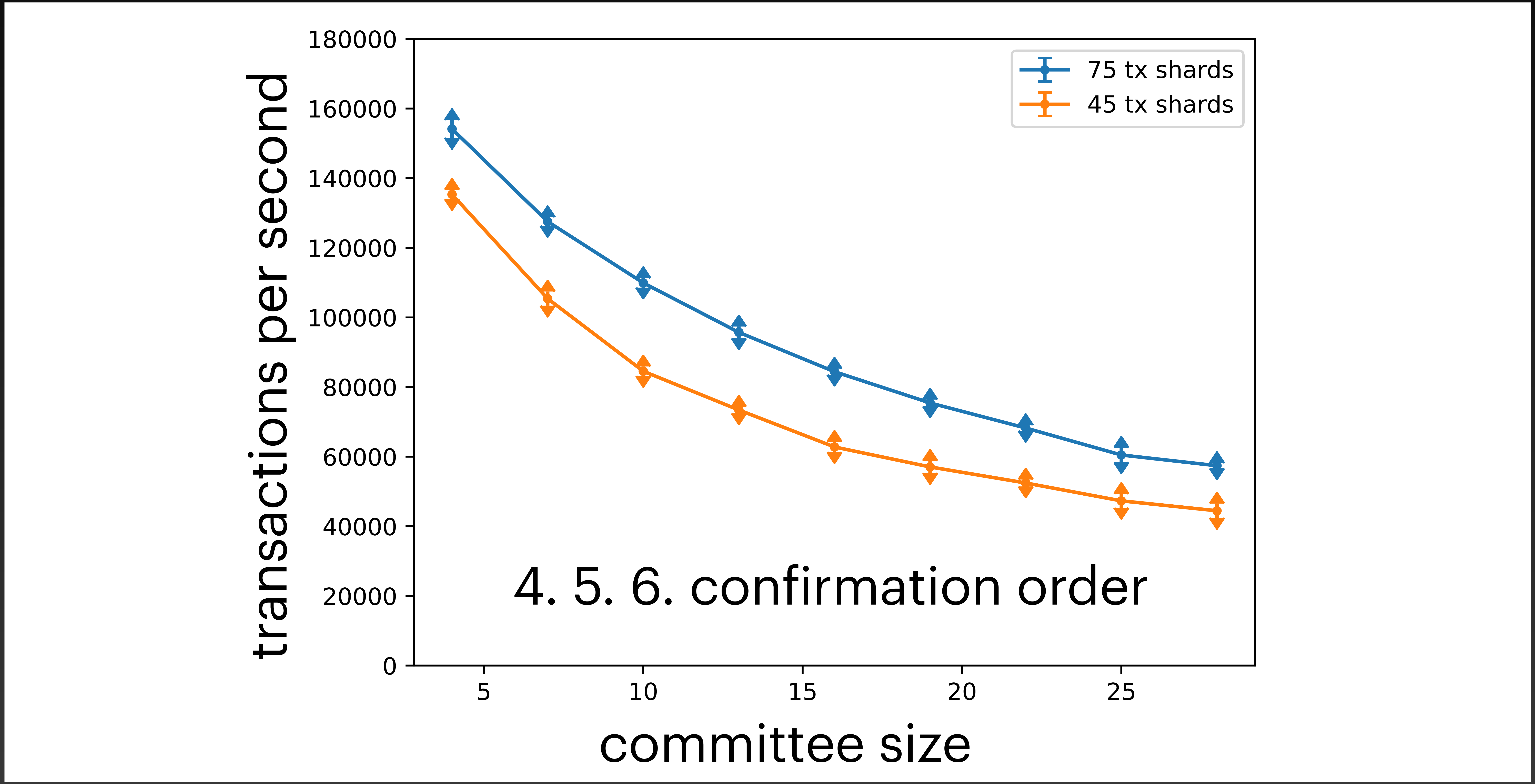
Influence of the number of authorities



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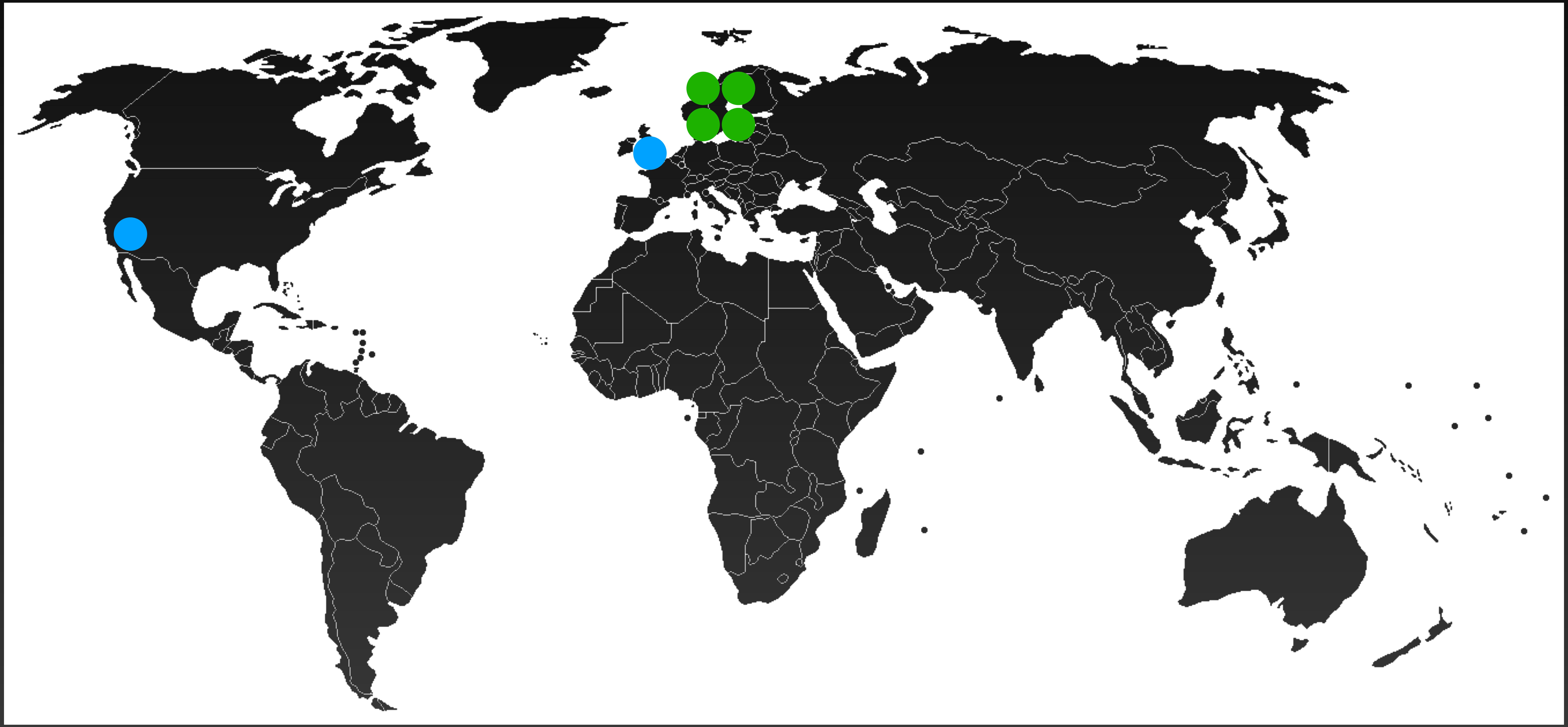
Latency setup



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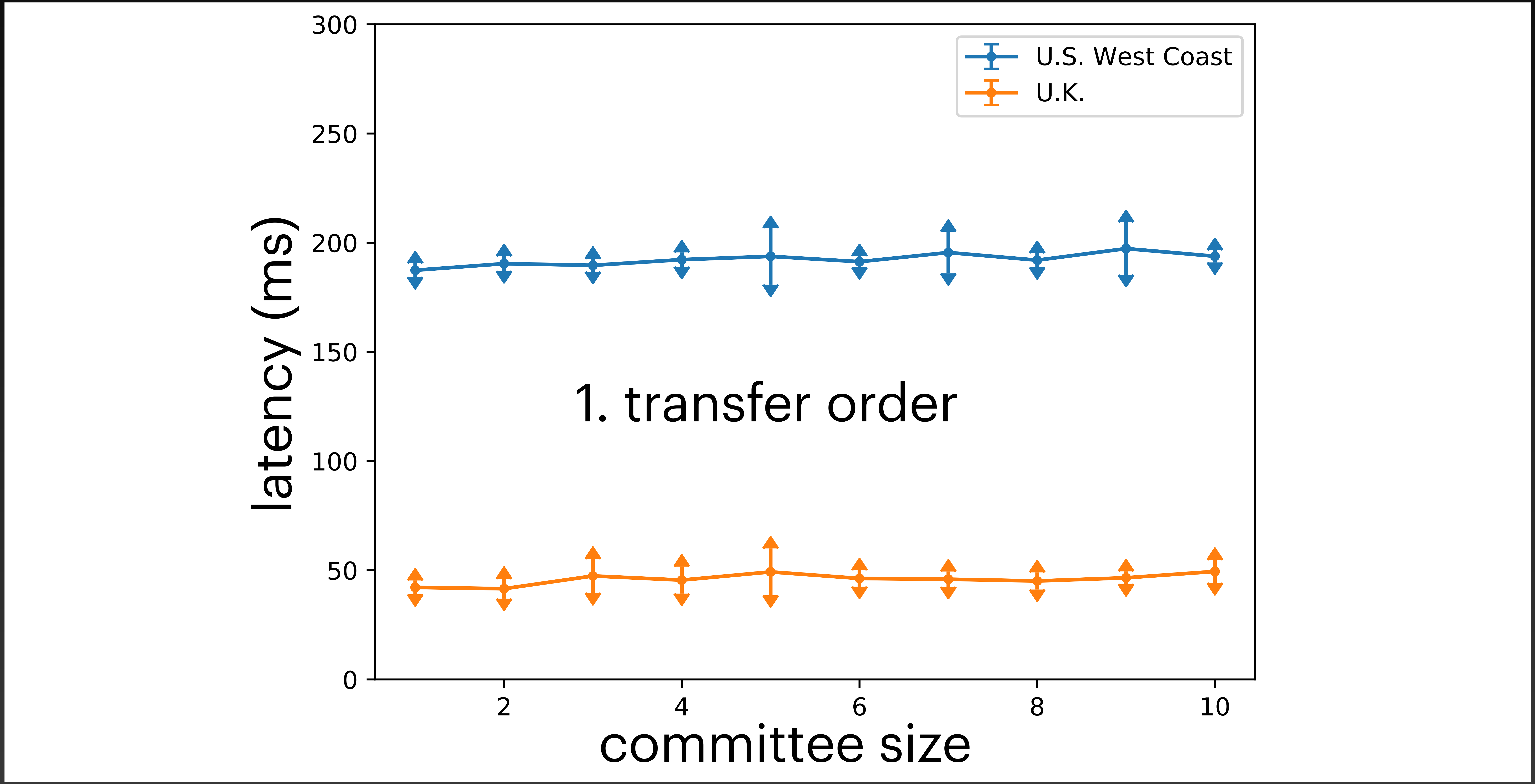
Latency



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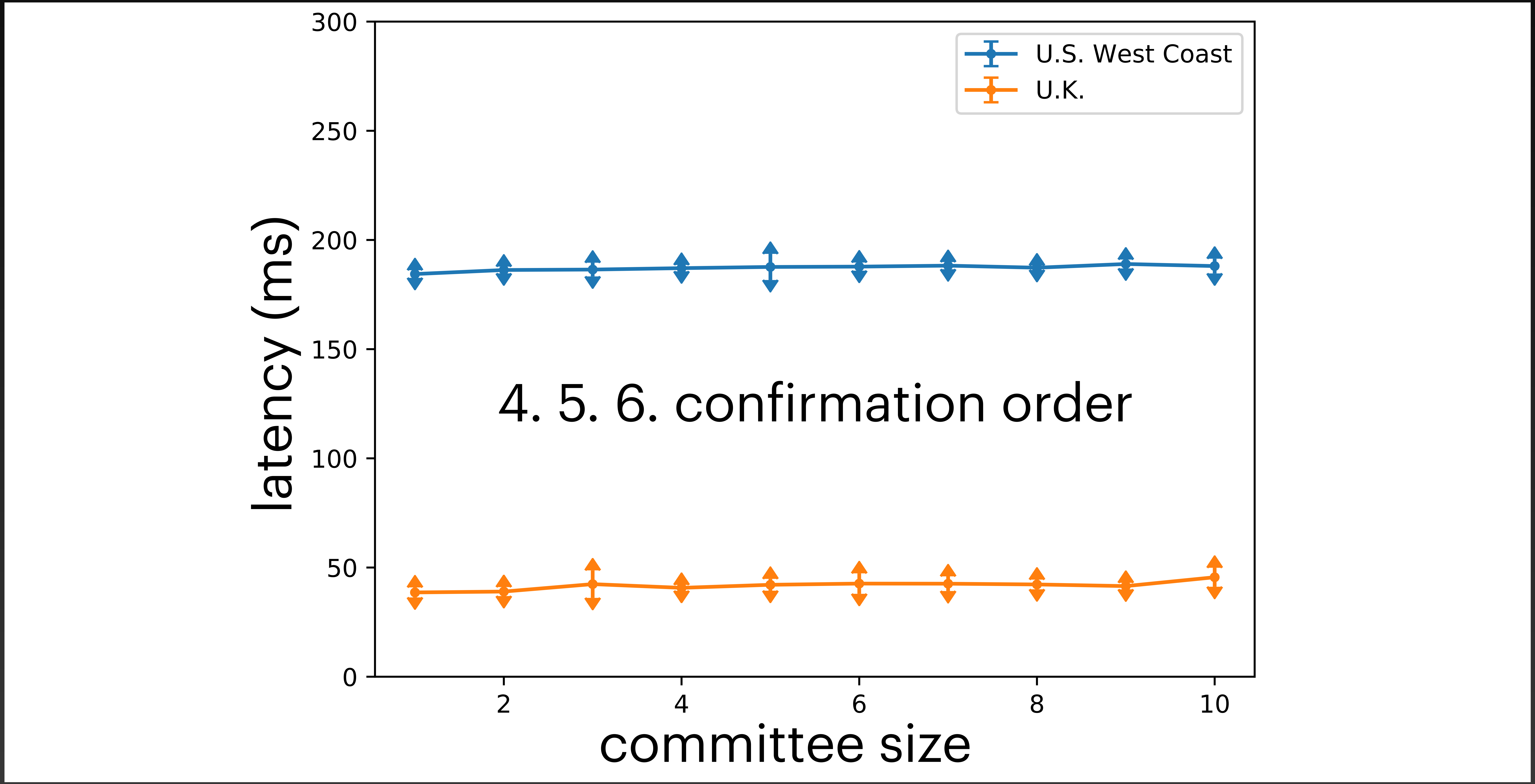
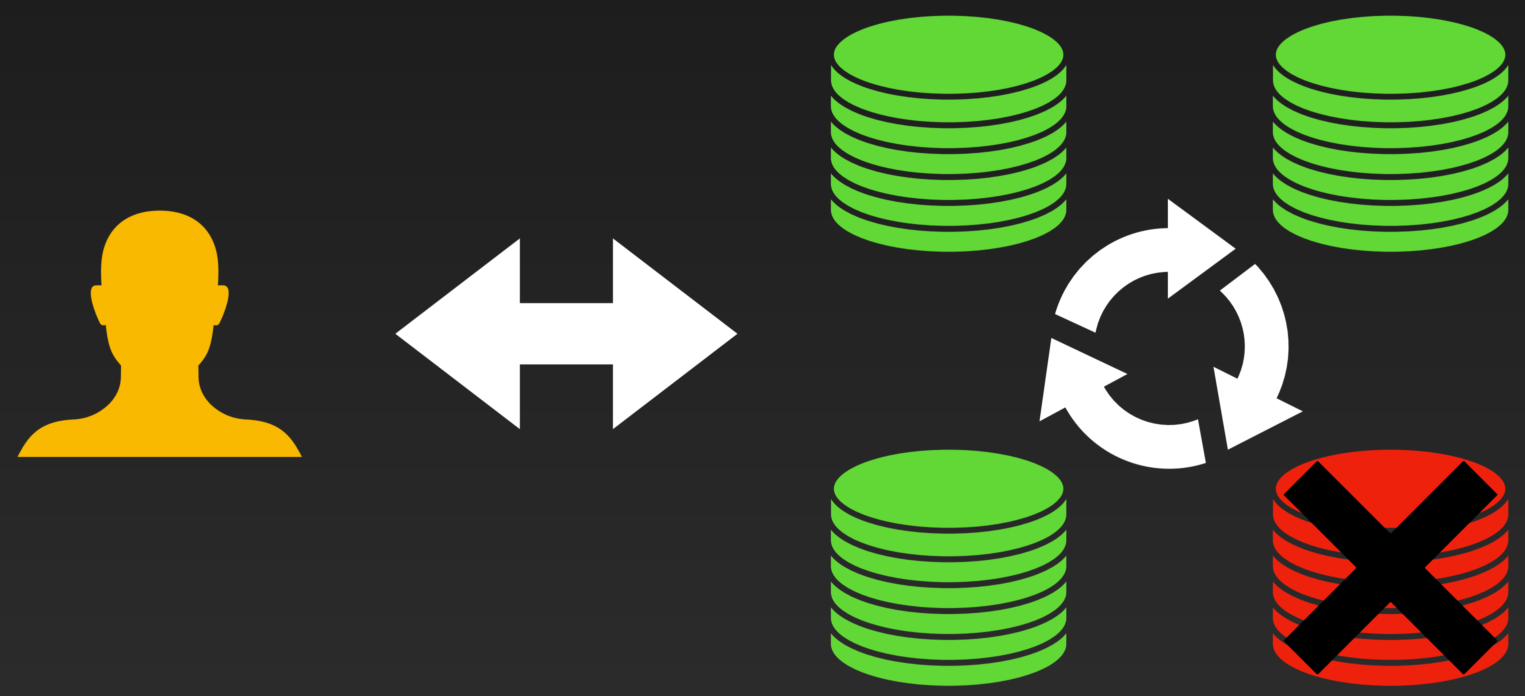
Latency



4. 5. 6. confirmation order

Worst-case efficiency

Blockchains



Bad leader can slow down the protocol

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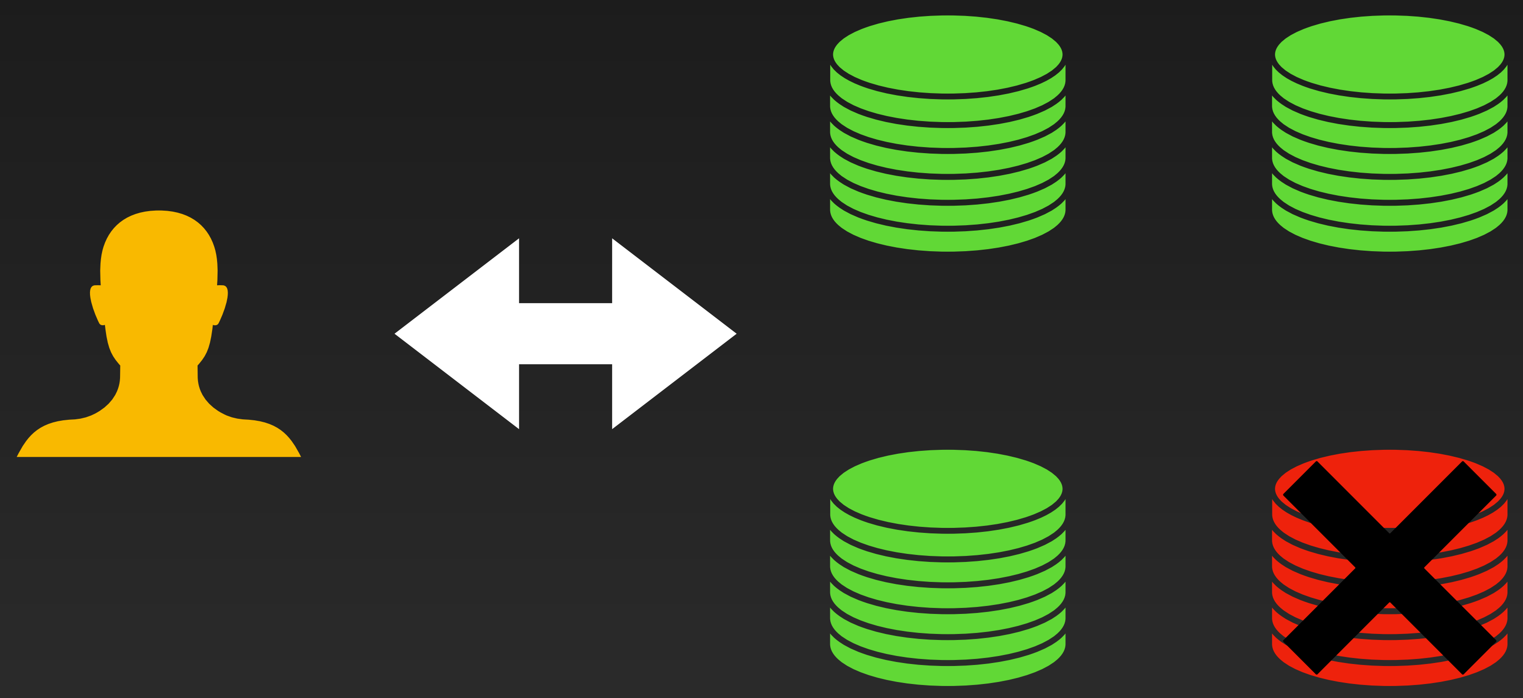

No leader, nothing changes

Conclusion

FastPay

- Based on Byzantine Consistent Broadcast
- Simple design, low latency, high capacity, very robust

- **Paper:** https://arxiv.org/abs/2003.11506
- **Code:** https://github.com/novifinancial/fastpay

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