Be My Guest

Welcoming Interoperability into IBC-Incompatible Blockchains

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Outline

Trusted Bridging

- Blockchains isolation limits interoperability.
  - Employer pays salary on Solana.
  - Landlord expects rent on Cosmos.
- Trusted Bridging:
  - Transfer tokens to a third party on Solana.
  - Third party *pinky promises* to pay on Cosmos.
- Pinky promises can *never* be broken, right?
  - Blockchains are about decentralisation.
  - Hacks, scams and human errors happen.

Trustless Bridging via IBC

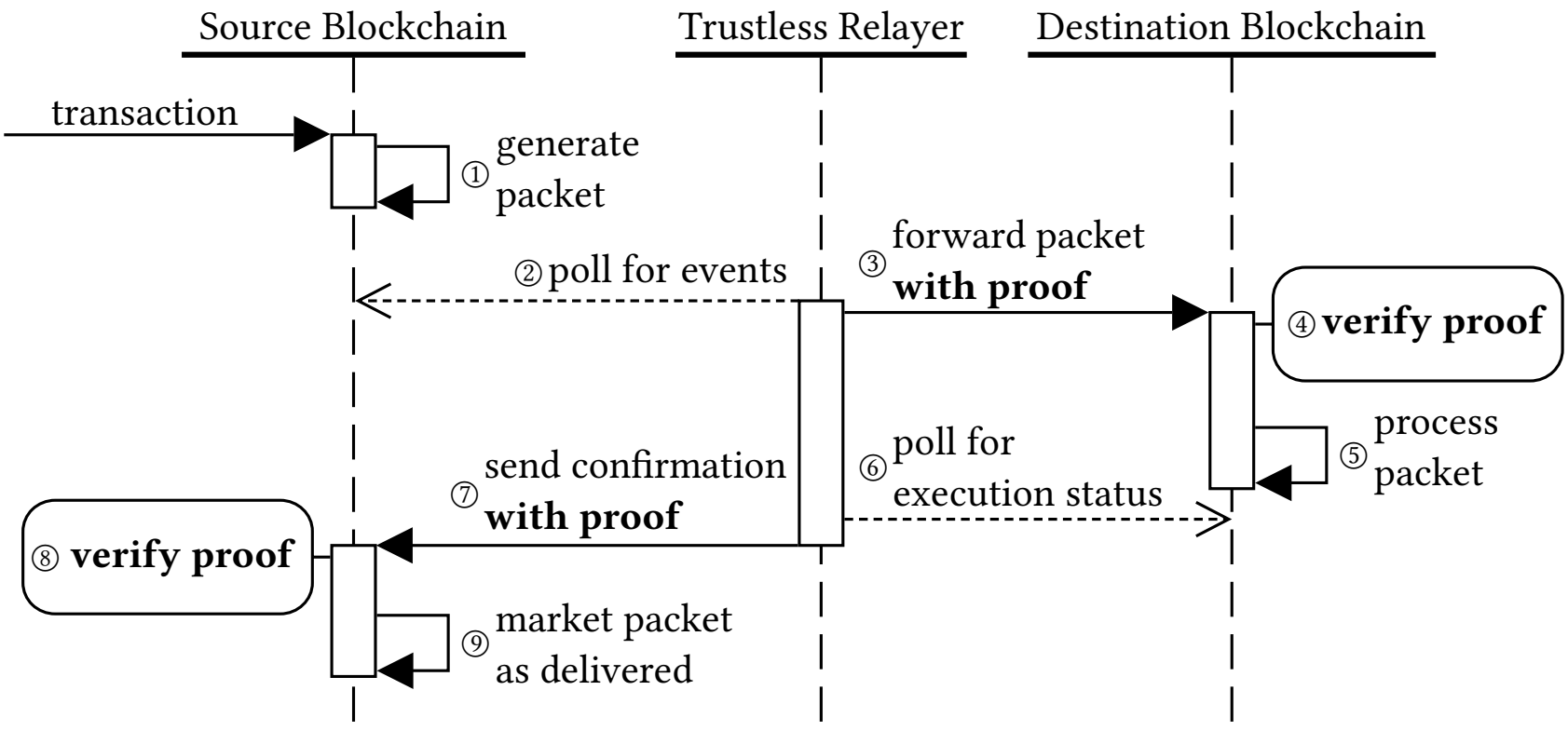
The Inter-Blockchain Communication (IBC) protocol

IBC offers a trustless method for cross-chain communication.

Host blockchain requirements

- Light client
- State proofs
- Introspection
- Block time
- ...

IBC Operation



- In case of timeout user submits proof of non-delivery.

IBC Limitations

Host blockchain requirements

- State proofs $\longrightarrow$ Unsupported by Solana
- Introspection $\longrightarrow$ Unsupported by NEAR

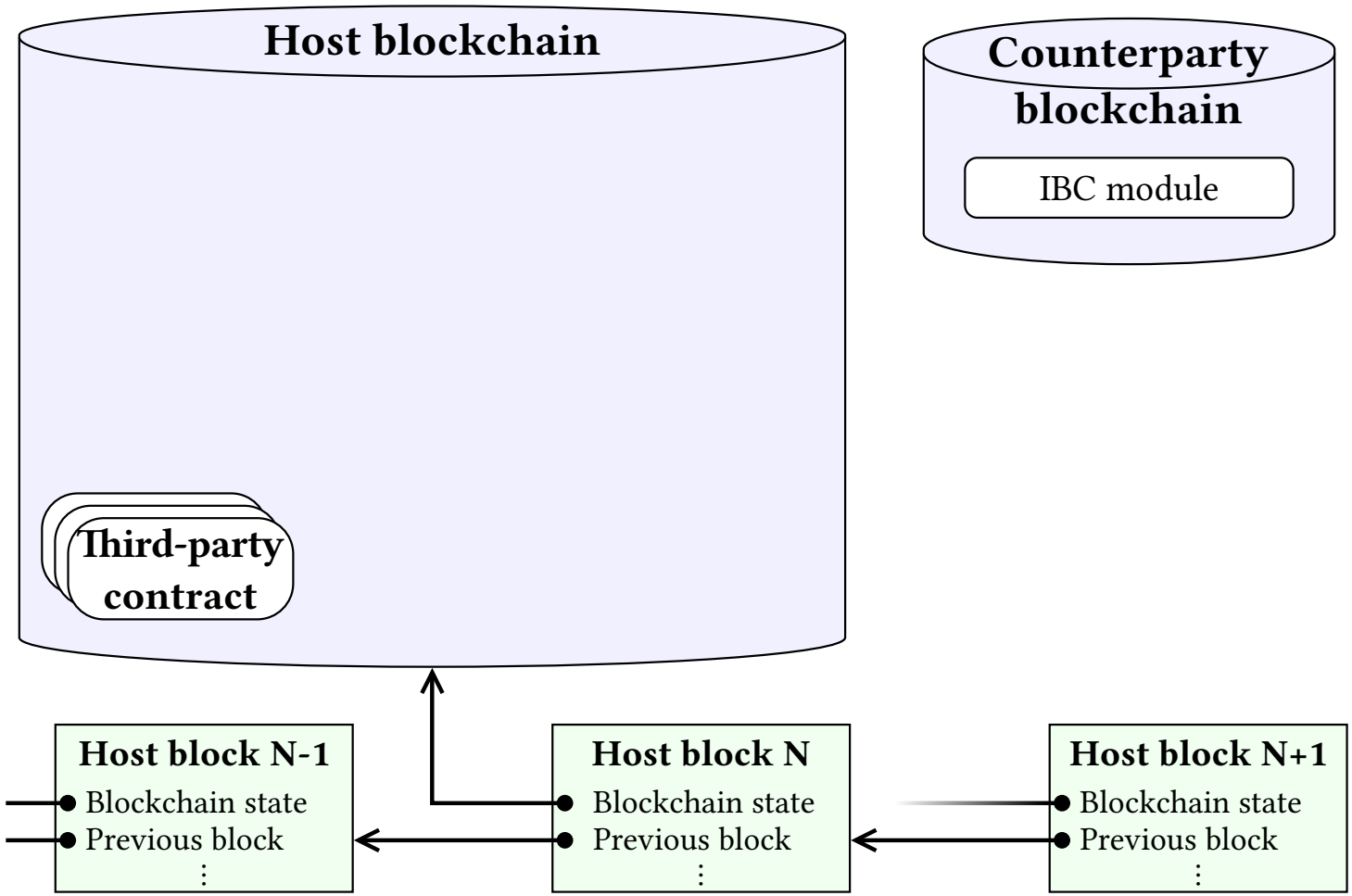
Guest Blockchain Design

Guest Blockchain

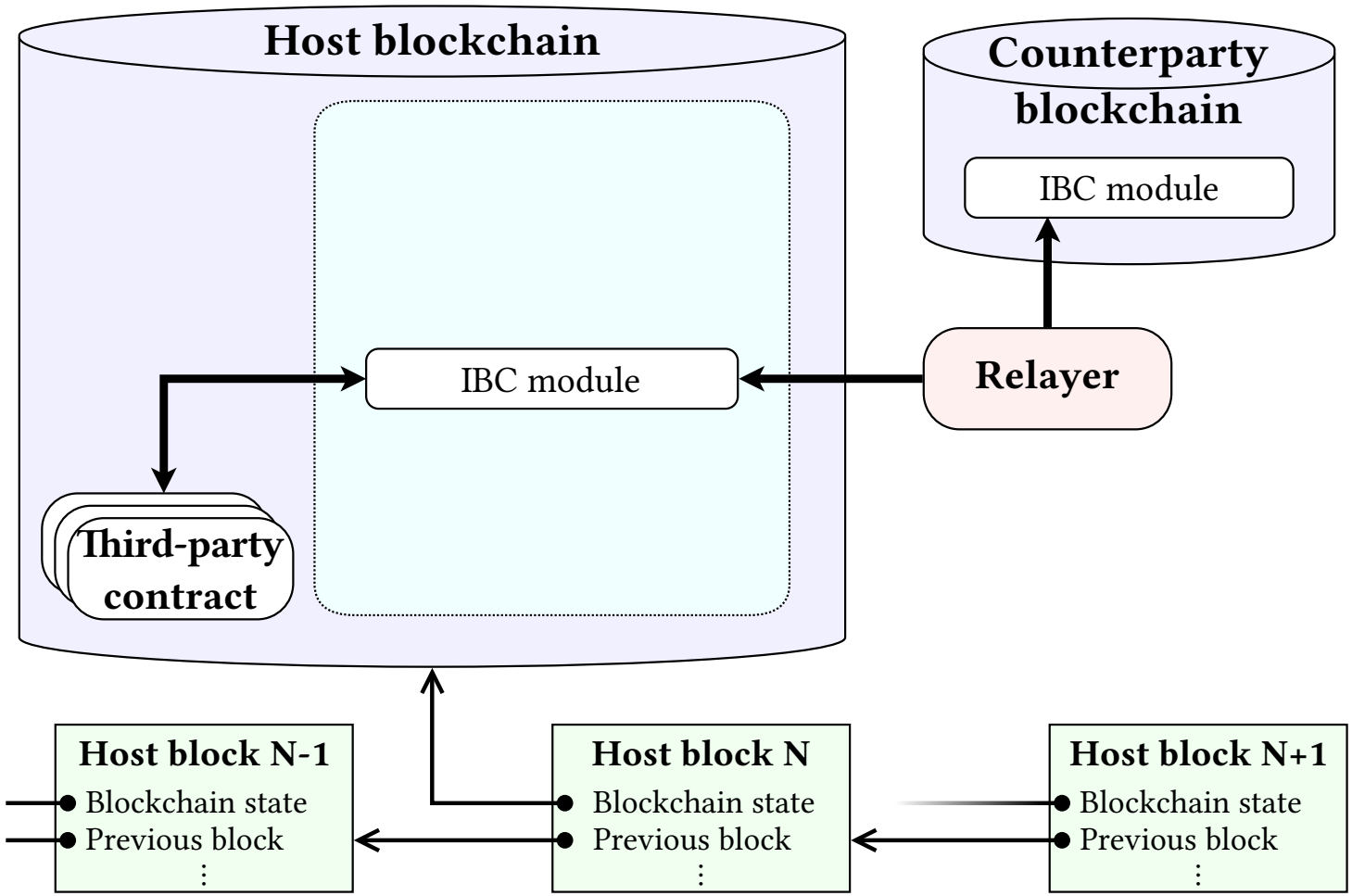
Guest Blockchain

- A virtual layer on top of the host blockchain.
- Implemented as a smart contract.
- Provides features required by IBC.
- Backed by a Proof-of-Stake consensus.

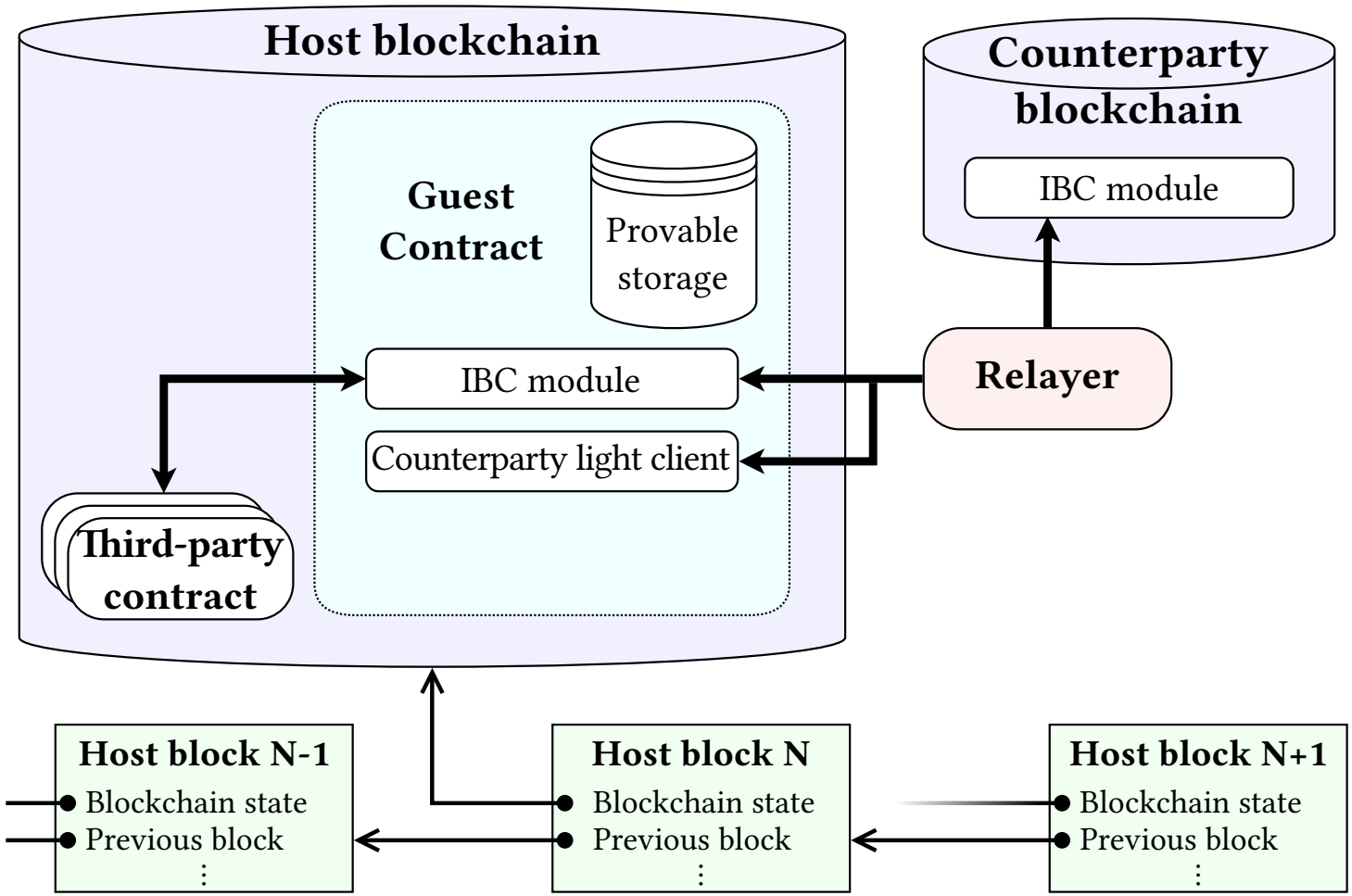
Guest Blockchain Architecture



Guest Blockchain Architecture

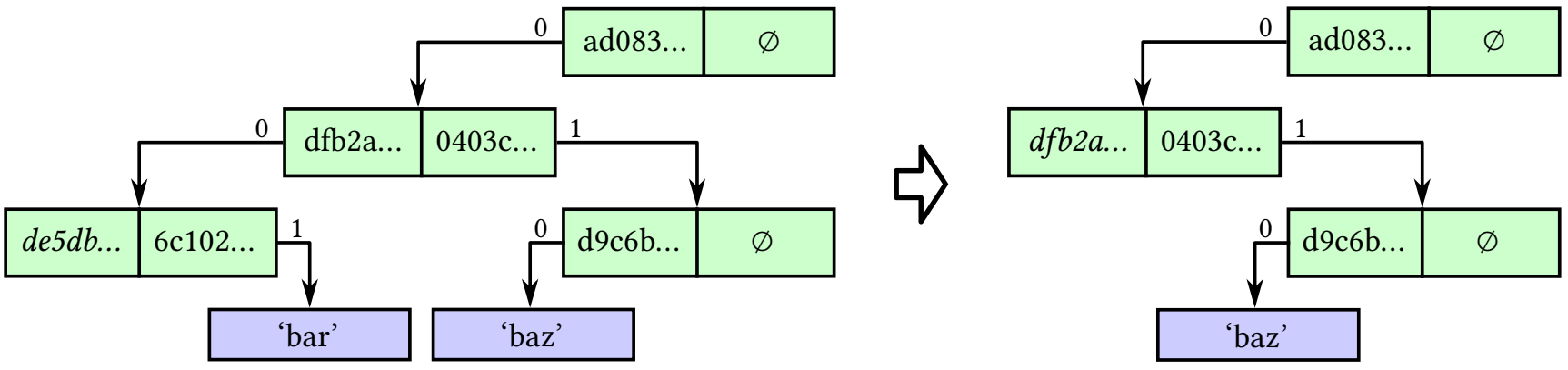


Guest Blockchain Architecture



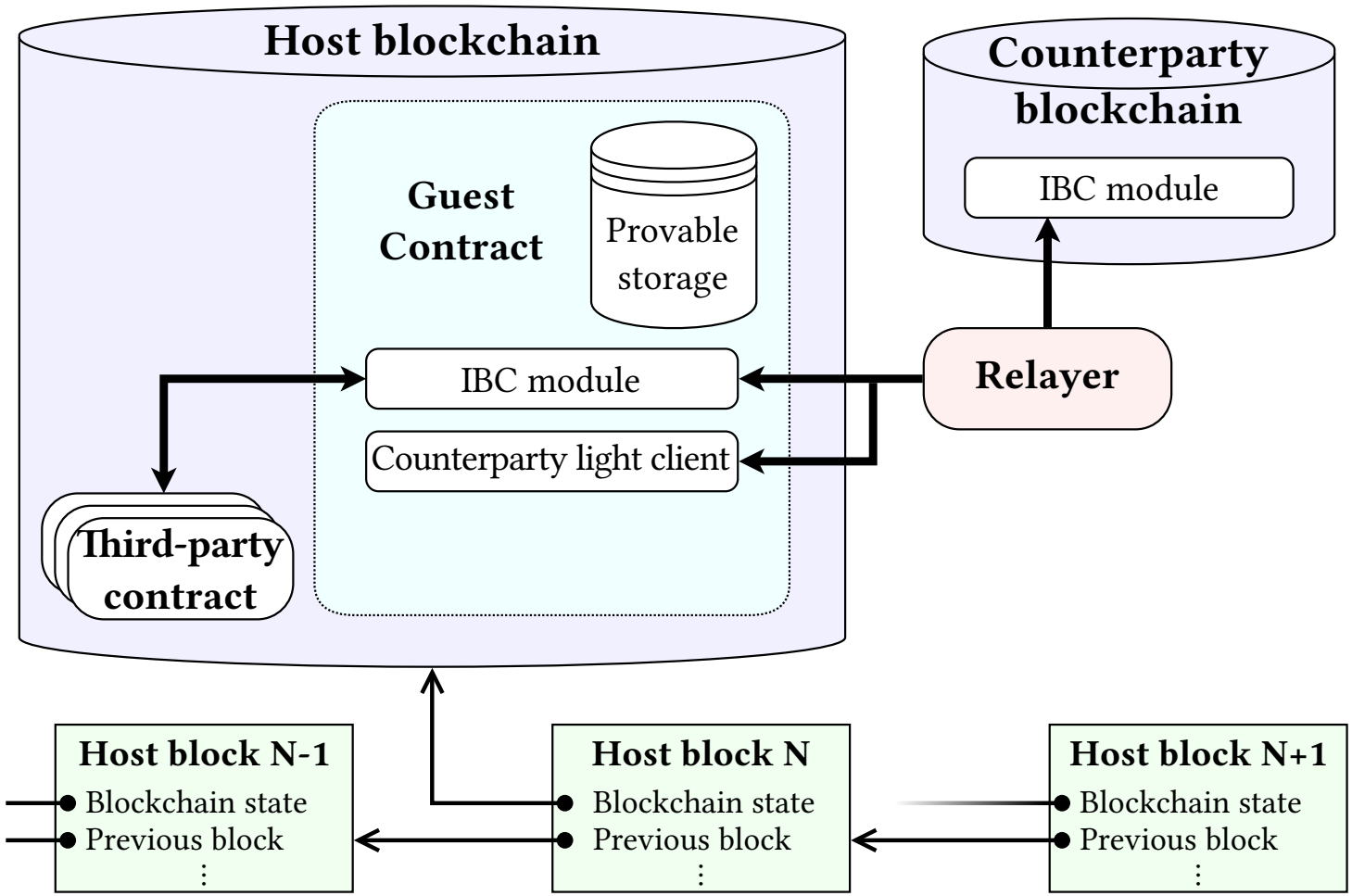
Sealable Trie

- Merkle trie with *sealing* support.

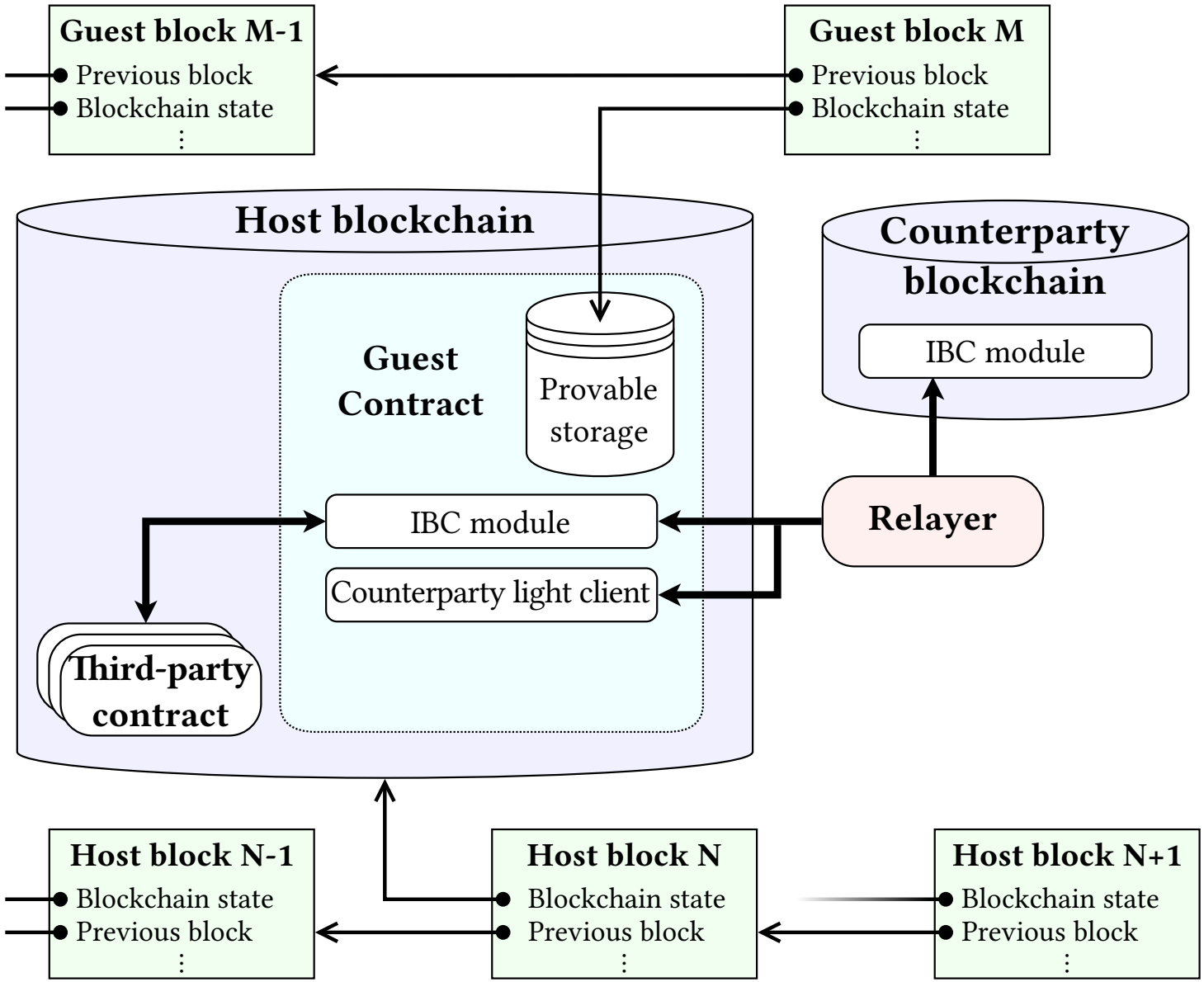


- Sealing 'bar' value removes the leaf node.
- Parent's both children are now sealed → it can be removed as well.

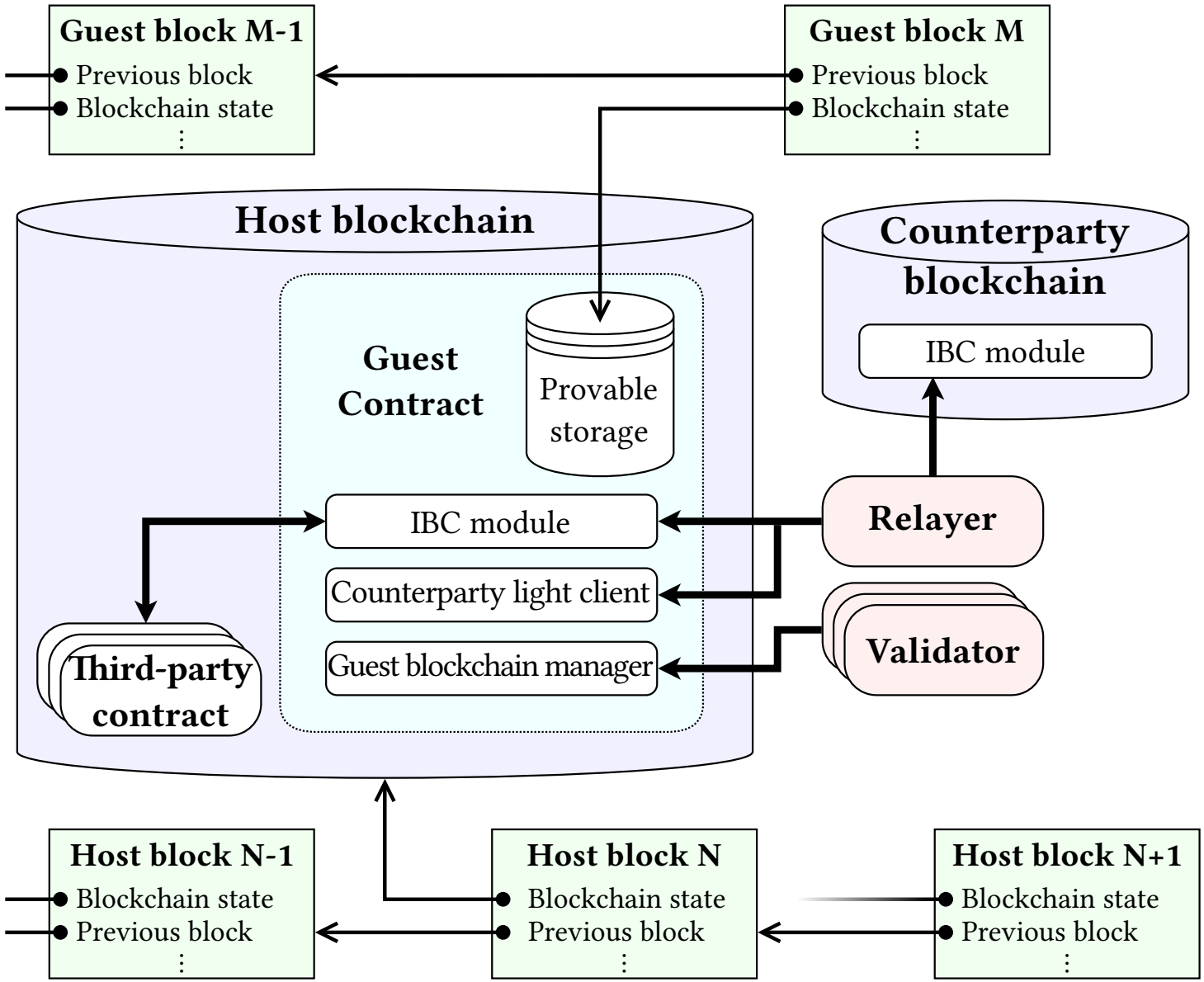
Guest Blockchain Architecture



Guest Blockchain Architecture



Guest Blockchain Architecture



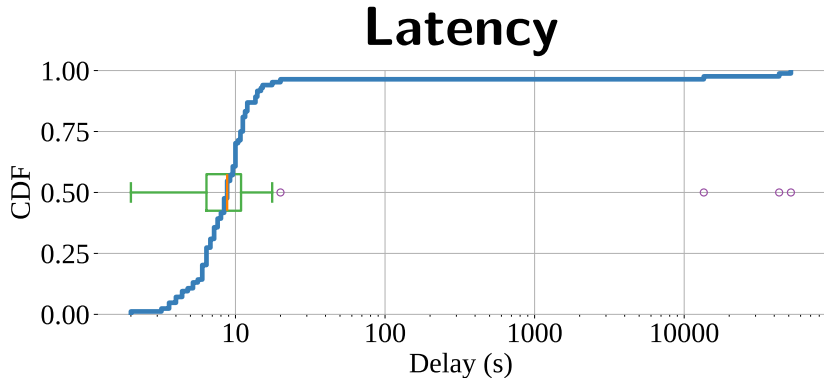
Guest Blockchain Evaluation

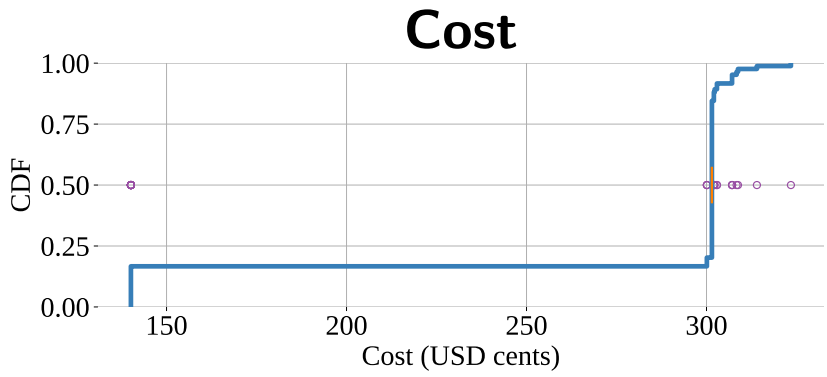
Guest Blockchain Evaluation

Location	Solana mainnet connected to Picasso network
Validators	24 Validators with a total stake of $1.25 million (assuming 1 SOL = 200 USD)
Period	September 2024
Focus	Cost and latency of the guest blockchain (contributions on the counterparty not measured)

Sending a Packet to the Counterparty

- All but three packets stored on finalised block within 21 s.
- Cost of $1.40–3.02.
- Clustered costs due to different fee policies.



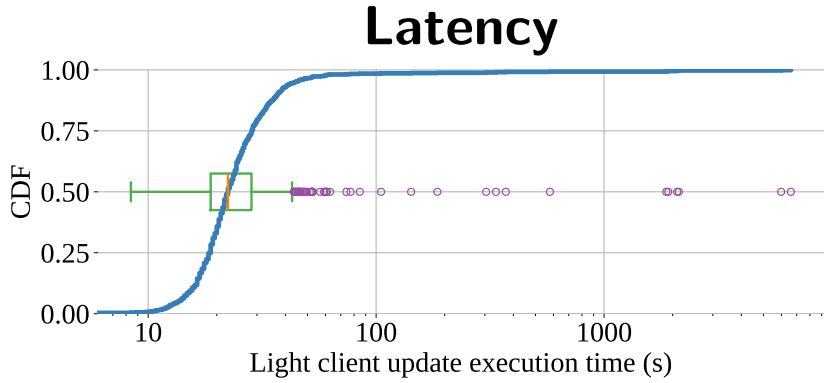


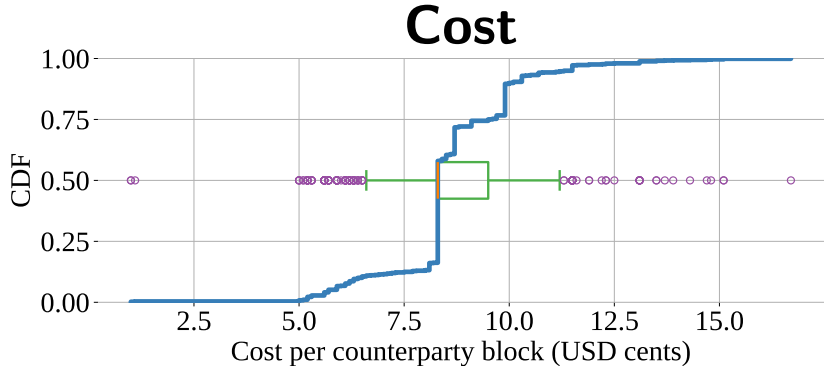
Receiving a Packet from the Counterparty

- Two step process:
  1. light client update
  2. packet forwarding

- 50% of packets took less than 25 seconds;
  96% less than a minute.

- Cost below 15 cents.

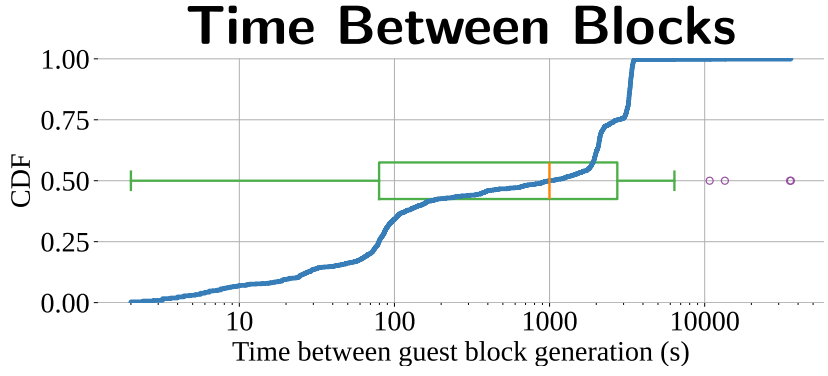




Validators

- Validator costs:
  - **Off-chain** connection to the host blockchain + cryptographic signature per guest block.
  - **On-chain** 0.25–1.40 cents per guest block.

- Importance of incentives:
  - Slashing has not been implemented.
  - 7 out of 24 Validators did not participate.



Conclusions

- Applicable to all blockchains supporting smart contracts.
  - No need to modify host blockchain.
- Enables connection to IBC network.
  - Over 100 zones and $1.2 billion volume in last 30 days.
- Minimal resource requirement for Validators.
  - Promise of rewards with low commitment.
- Small overhead.
  - Cost & latency in-line with Chervinski et al. (2023).

Thank you

Questions?

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Guest Blockchain implementation:
`https://codeberg.org/mina86/be-my-guest`

Cite the Paper

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