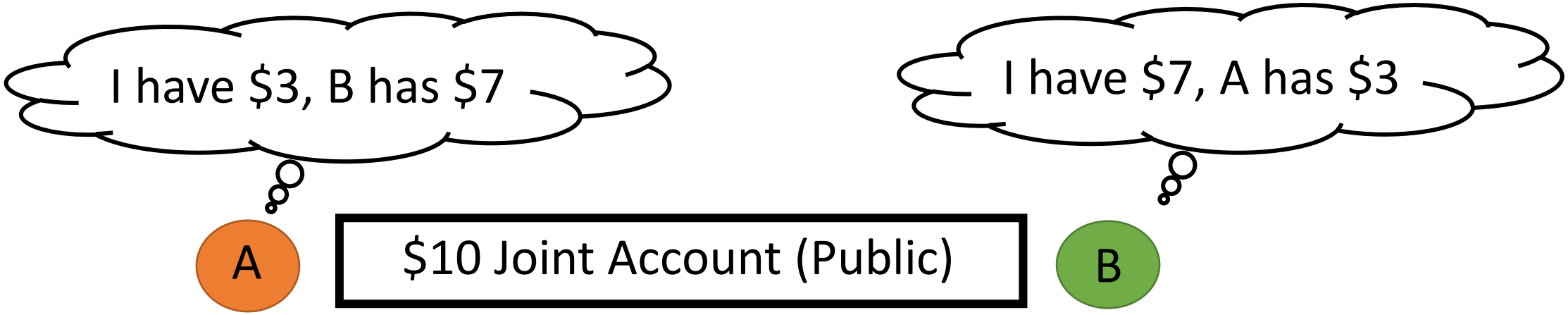
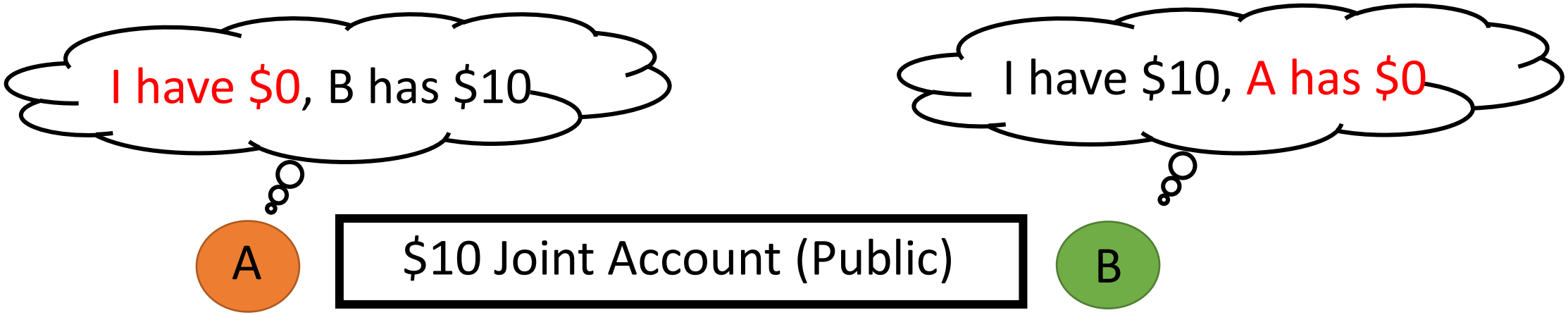
Layer 2 Cryptocurrency Networks

- Cryptocurrency transaction rates are slow.
- How can we build trusted relationships in an untrusted context?
- Answer: Private recordkeeping of funds in a joint account.



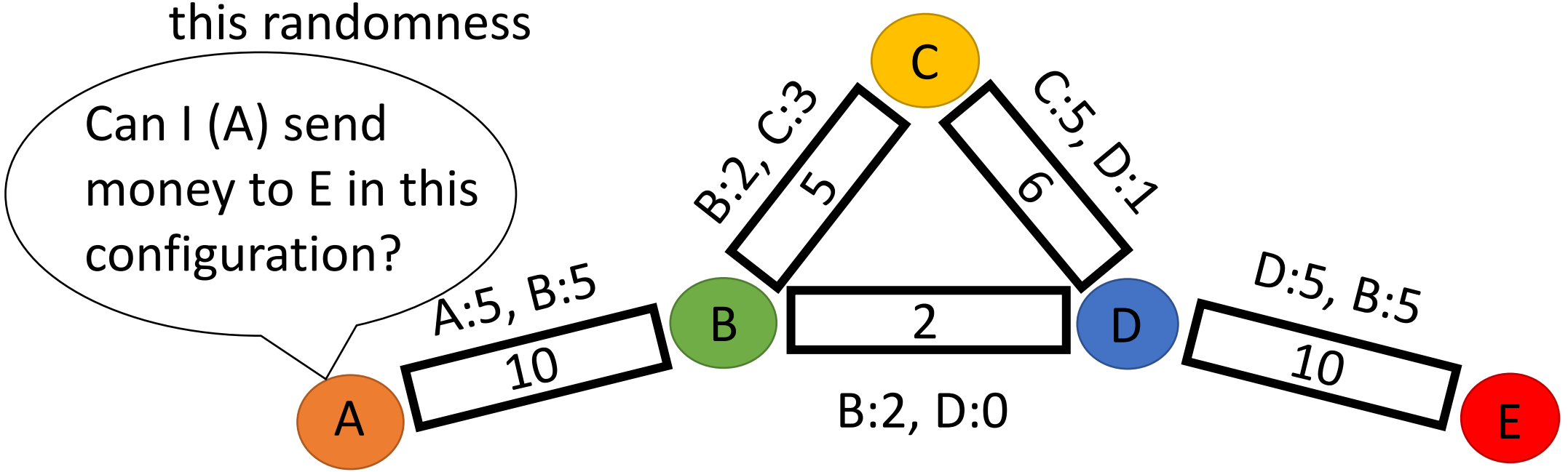
Cost vs. Performance in Layer 2 Networks

- Agents can run out of money – no network settles every transaction
- Larger shared accounts mean higher cost but fewer failed transactions
- How can we compare different network structures?



Liquidity in Layer 2 Networks

- Model transactions as coming from an external, stochastic process
- Hence, network configuration evolves randomly
  - Induces non-uniform distribution on configurations
- Liquidity of a transaction is the chance a transaction is feasible, given this randomness



Summary of Results

1. Compute liquidity in an efficient manner – via reduction to electrical resistance
2. Efficient configuration sampling algorithm – via reduction to sampling from distribution on a convex set in $\mathbb{R}^n$
3. Liquidity is *monotone*: Adding edges cannot hurt liquidity (in many cases of interest) – via connection to generating polynomials and Kirchhoff's Laws
4. Results apply to the "Credit Network" model, of which Layer 2 cryptocurrency networks are one instance.