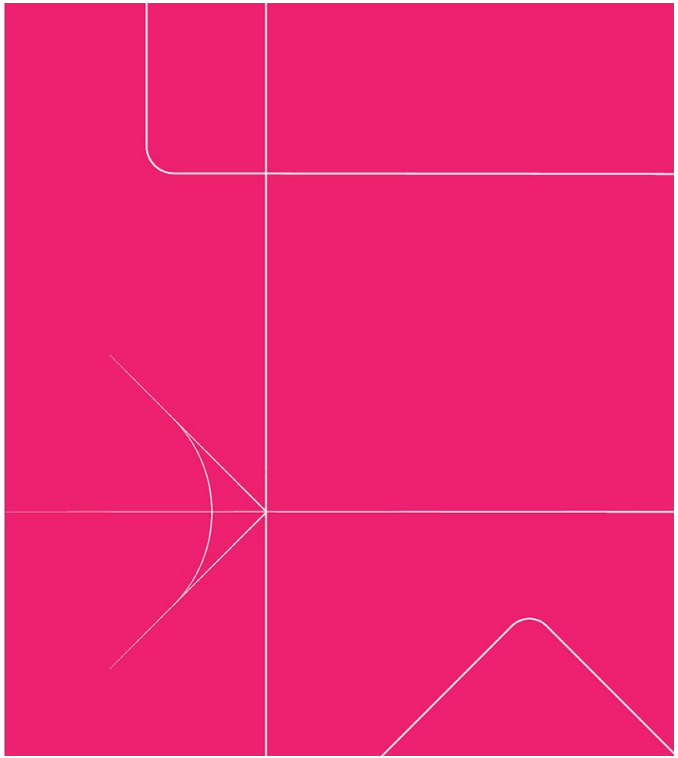
Robustness for Dishonest Majority in Threshold ECDSA

Damian Straszak

Based on ***Threshold ECDSA for Decentralized Asset Custody***

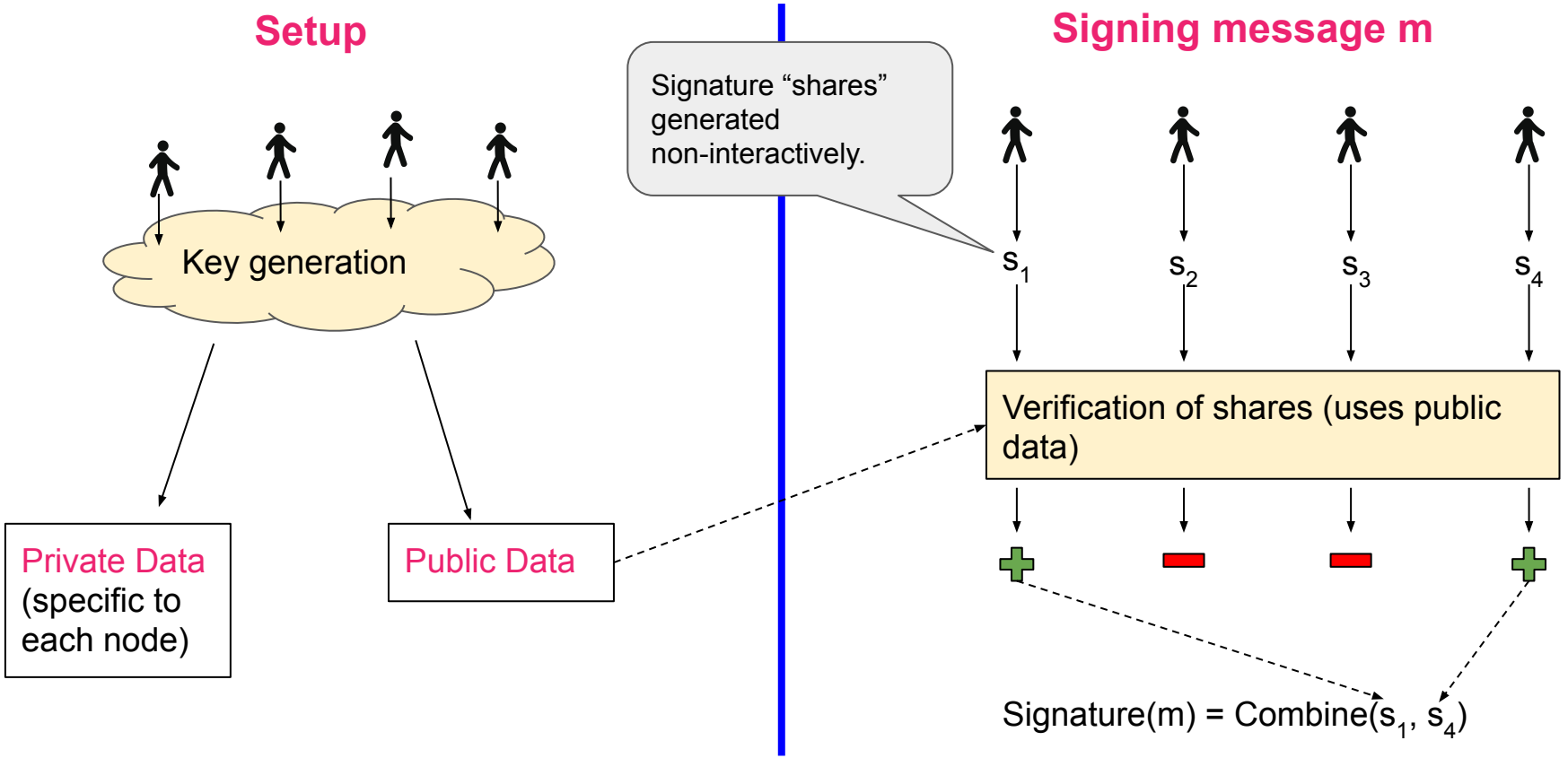
Joint work with: **Adam Gągol, Jędrzej Kula** and **Michał Świętek**



CARDINAL
CRYPTOGRAPHY

Threshold Signature schemes: BLS vs ECDSA

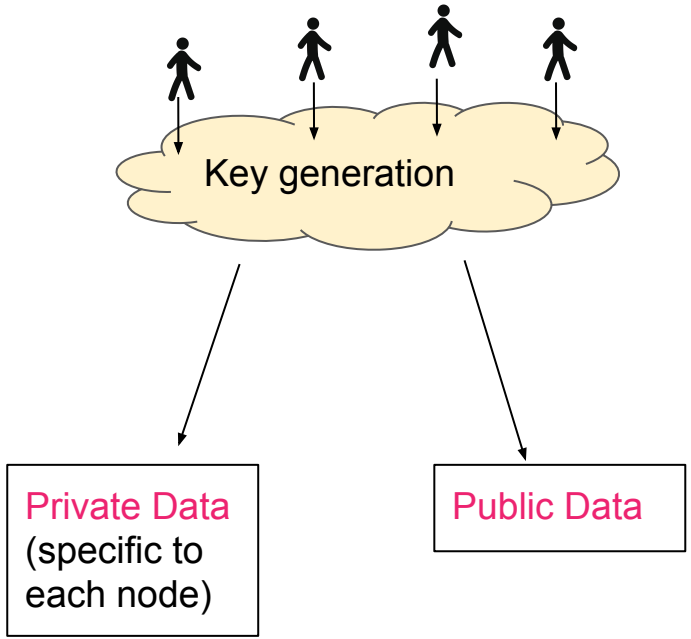
BLS threshold signatures 2 of 4 [BLS'04, Boldyreva'03]



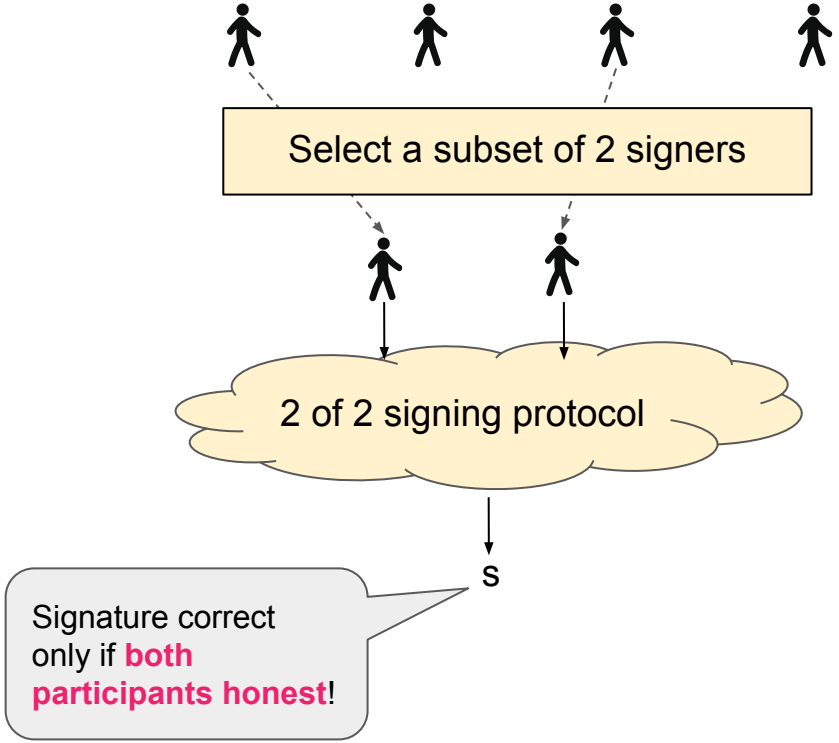
Threshold Signature schemes: BLS vs ECDSA

ECDSA threshold signatures **2 of 4** **[GG18, LN18, DKLS18, CCL+20, CMP20, GG20, …]**

Setup



Signing message m

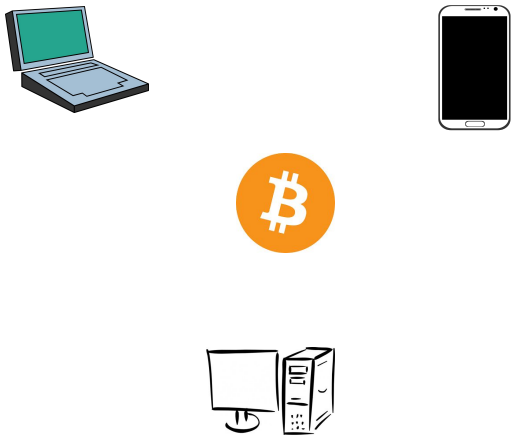


Applications

ECDSA threshold signatures **[GG18, LN18, DKLS18, CCL+20, CMP20, GG20, …]**

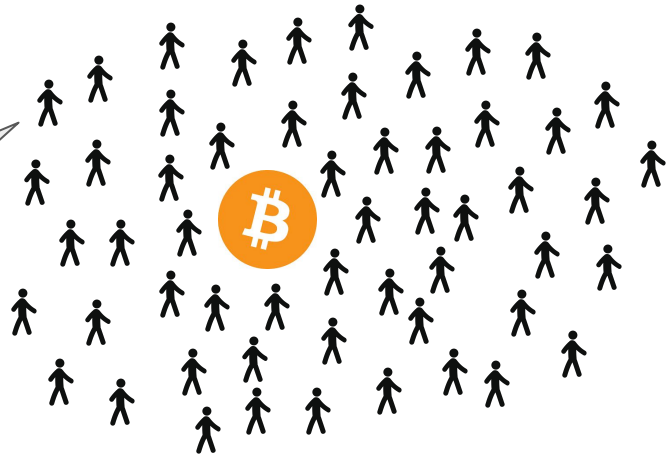
Great for

distributing an ECDSA key over several devices.



Not so great for

holding a joint custody by a large number of nodes over a BTC account.

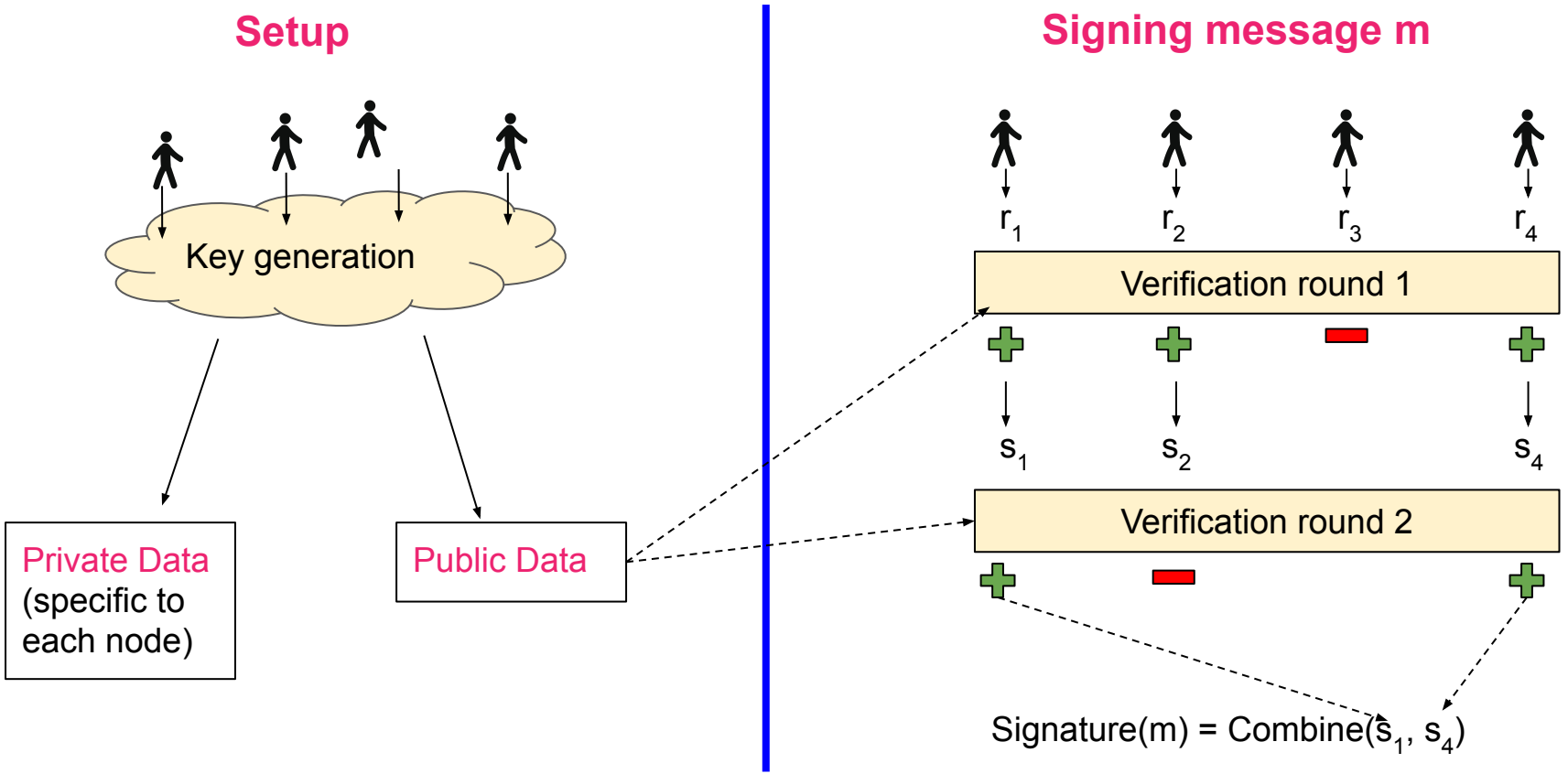


Many of the nodes can be dishonest, tricky to select "**honest subset**" of signers. **BLS-style** would work much better here.

Useful for blockchain "**bridges**"

New Threshold ECDSA Scheme

ECDSA threshold signatures **2 of 4** **[GKSS'20]** based on **[LN'18]**



Conclusion

- Robust threshold ECDSA scheme similar to “BLS style” (only **little interaction** required when signing)
- Useful when:
  - **Large** number of nodes
  - Nodes **dishonest** or prone to **DDoS** attacks
- Experiments: scales to **~100 nodes** with **<1 sec** signing time

Future work:

- Setup not quite robust yet
- Protocol heavy on ZKPs