Trusted Parties and Their Twins

Manoj Prabhakaran & Mike Rosulek

Splittability!
(The Disney Version)

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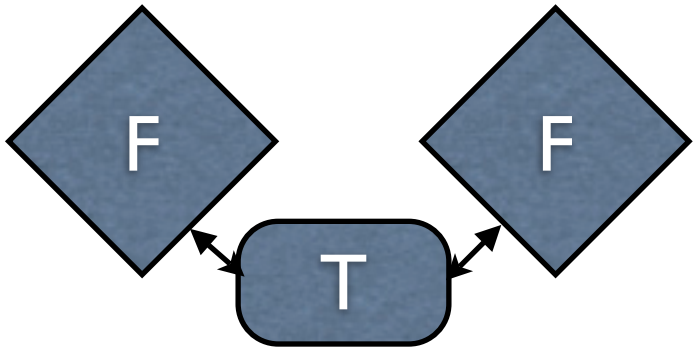

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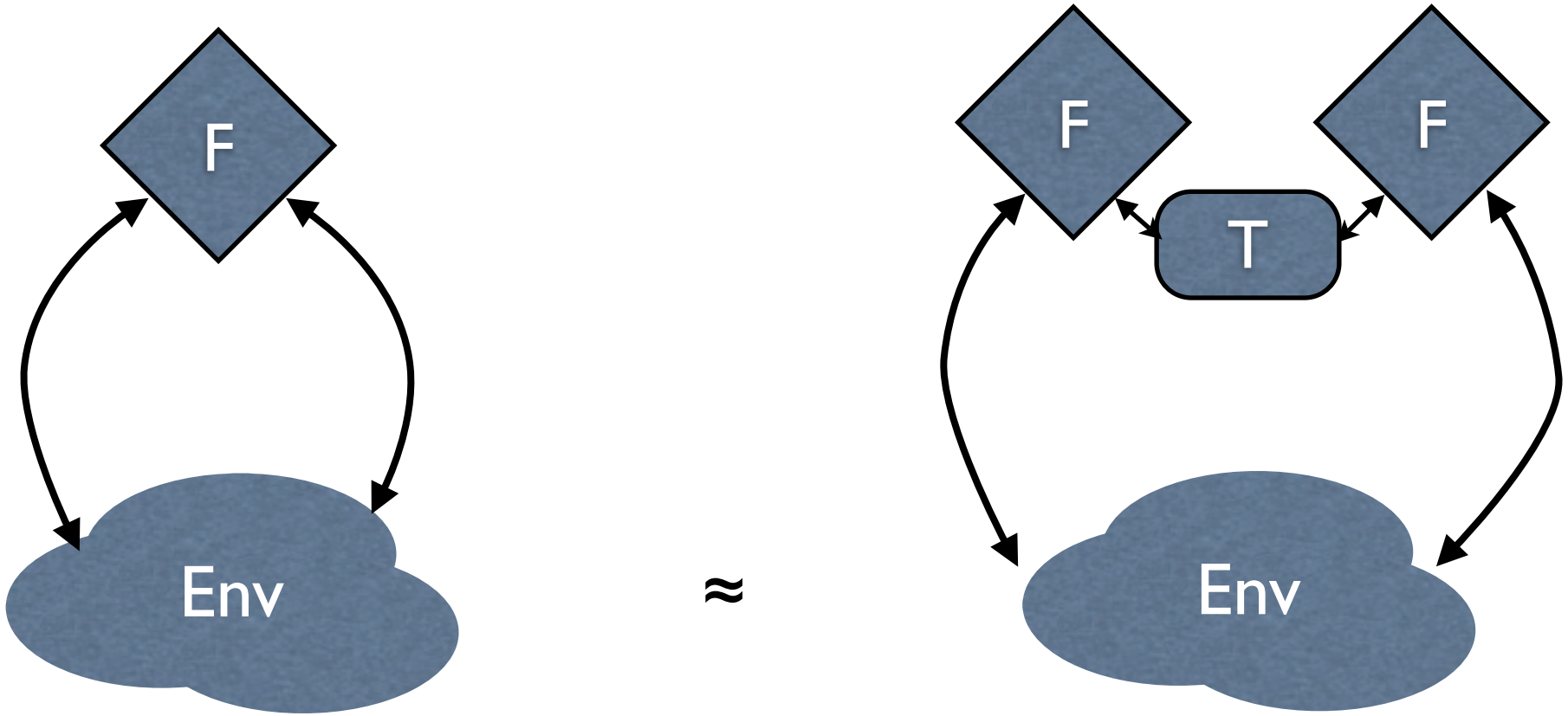
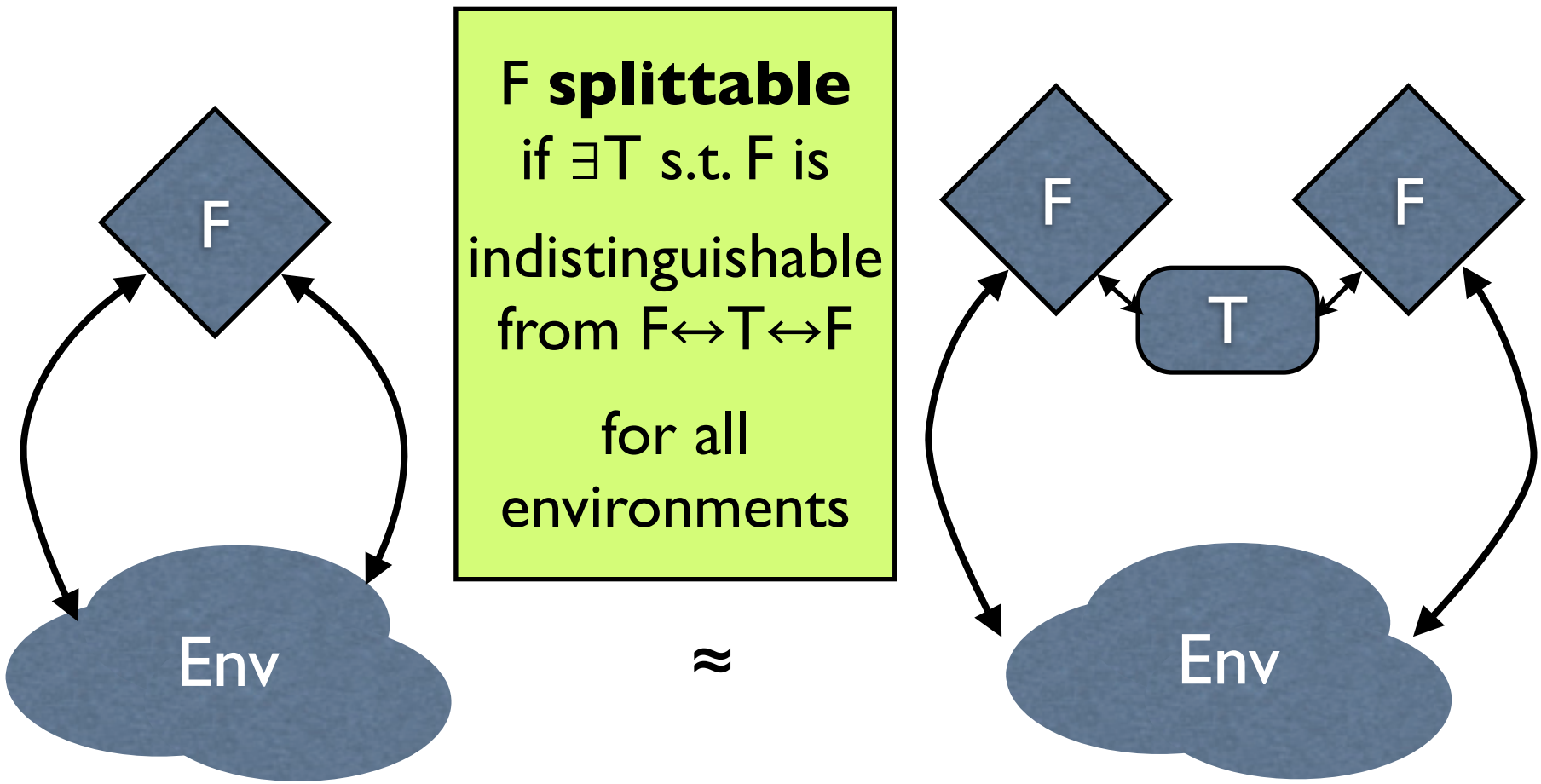
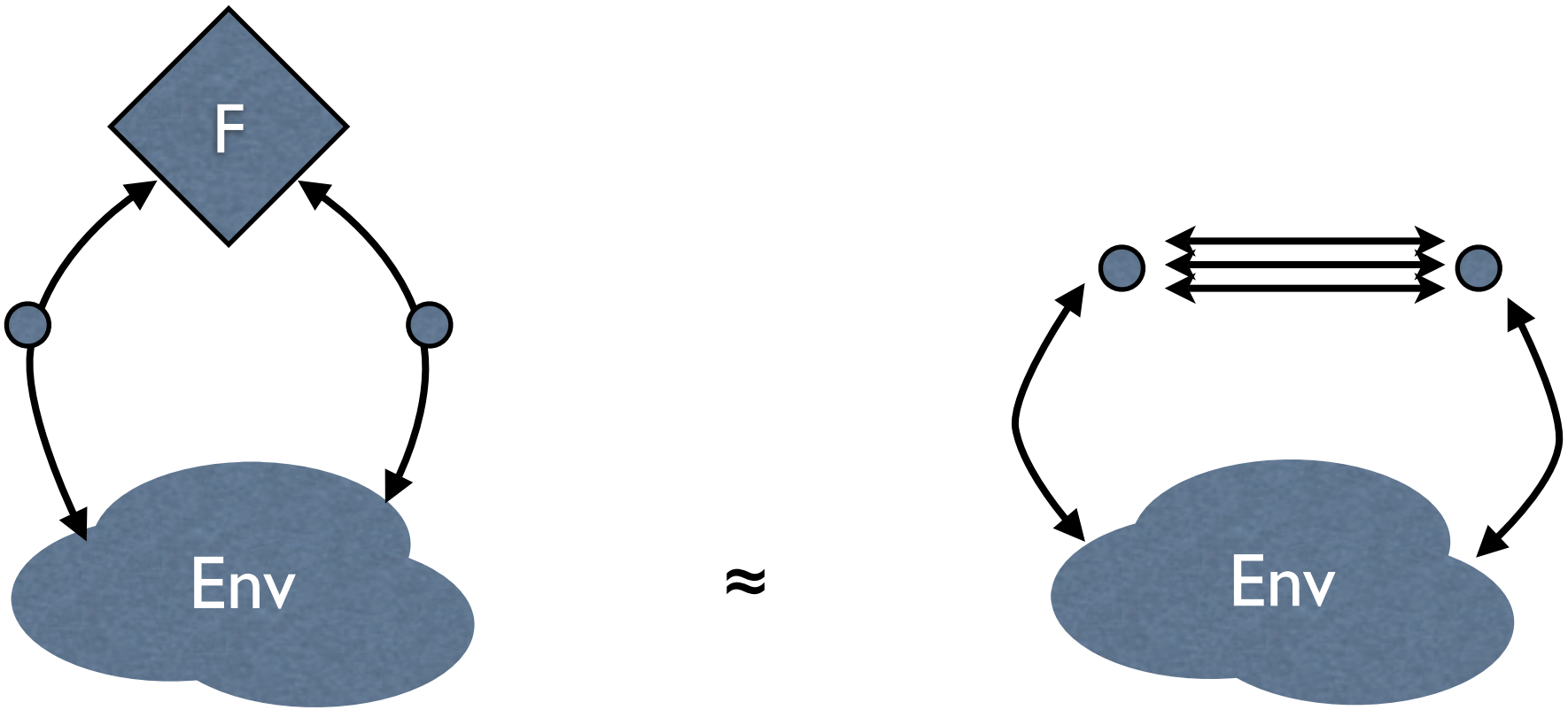
Splittability!



Splittability!



Theorem:
Splittable = Realizable



When is there no protocol possible?

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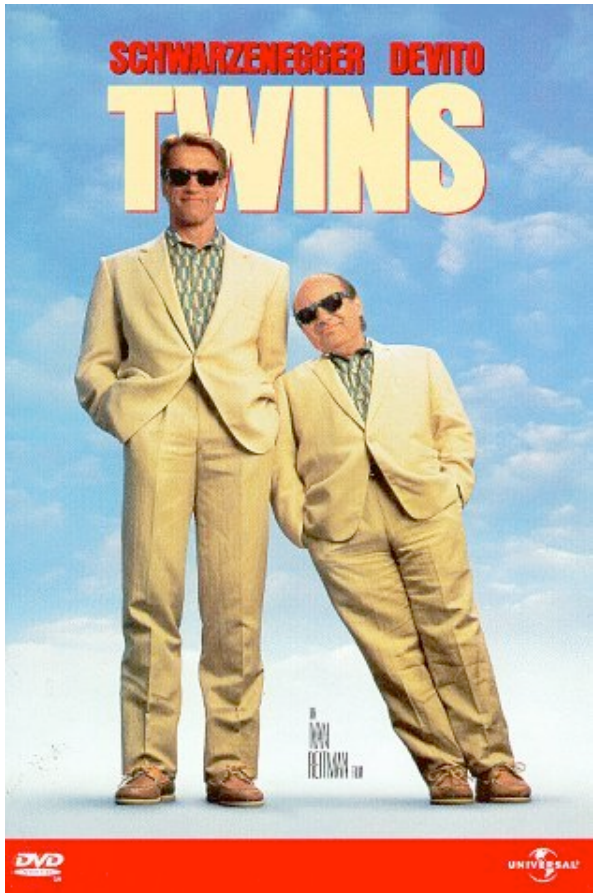
If there's no way to keep the trusted party synchronized with its twin



Using our characterization

- Easy to show impossibility of:
  - Commitment, simultaneous exchange, oblivious transfer, coin-flipping, ...
- Explicit and exact characterization for 2-party non-reactive functionalities
  - Subsumes impossibility of Canetti-Kushilevitz-Lindell'06
- Characterization holds also for m-party, reactive, randomized functionalities.
- Intriguing gaps/results for m-party (m>2) settings

Generalization: Splittability Partial Order

- Extends to a partial order F < G ("F splits w.r.t. G")
  - Gives results on realizability of F w.r.t G
  - Complete characterization when G is self-splittable (G<G) !
- Other cute things...

Hiding Functionalities

- Functionality version of one-way functions
  - e.g. oblivious transfer
- Can construct hardcore predicates for HFs
  - Then use to realize commitment, etc. (everything?)
  - Goldreich-Levin predicate for HFs!
  - Several open questions