University of Stuttgart
Institute of
Information Security

Universal Composability: A Comparison of Different Models

Daniel Rausch

FOSAD 2018

Simulation-Based Security

Definition of simulatability (basic idea):

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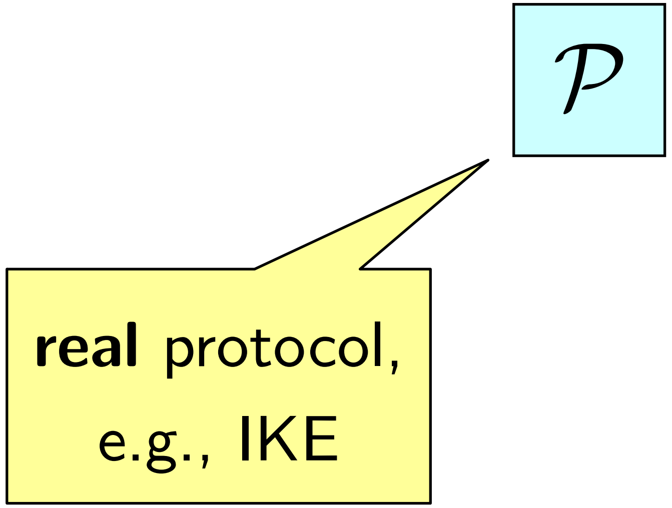

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real protocol, e.g., IKE

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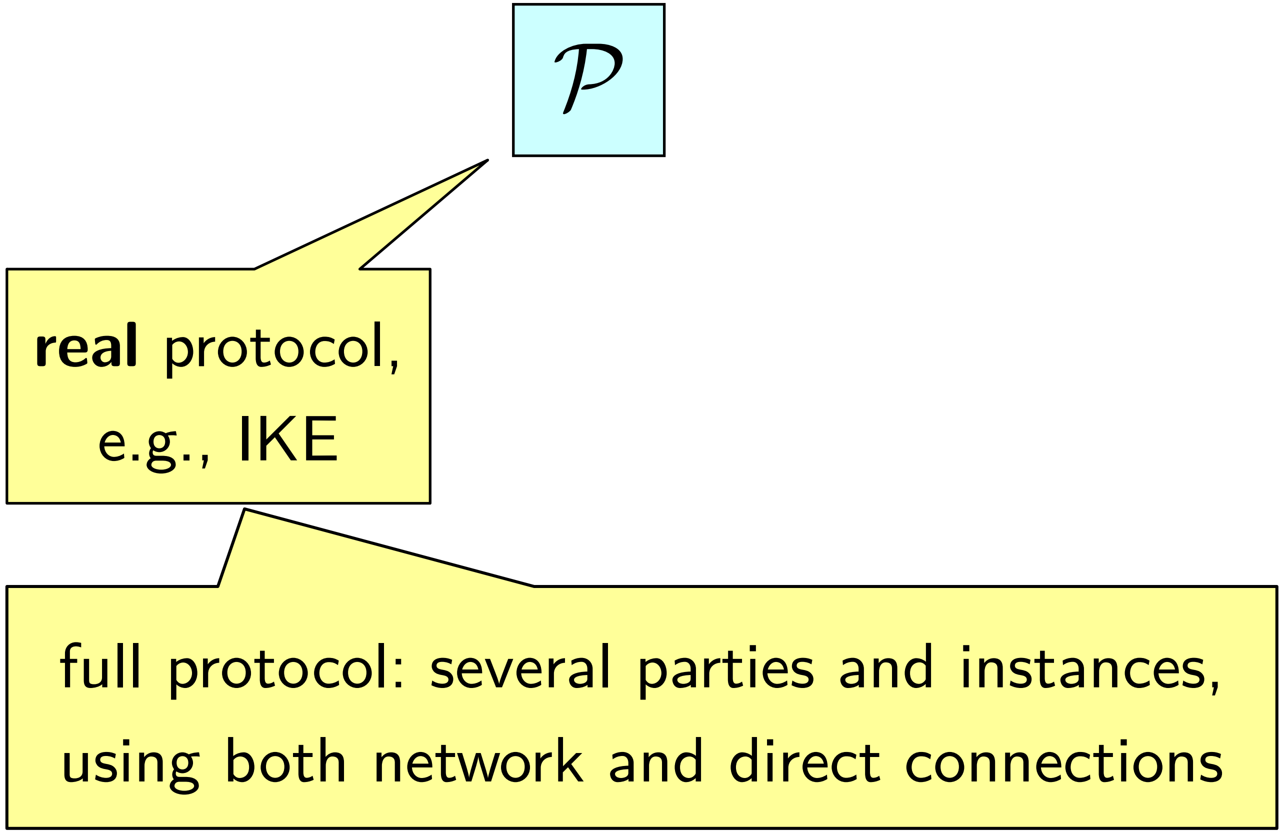

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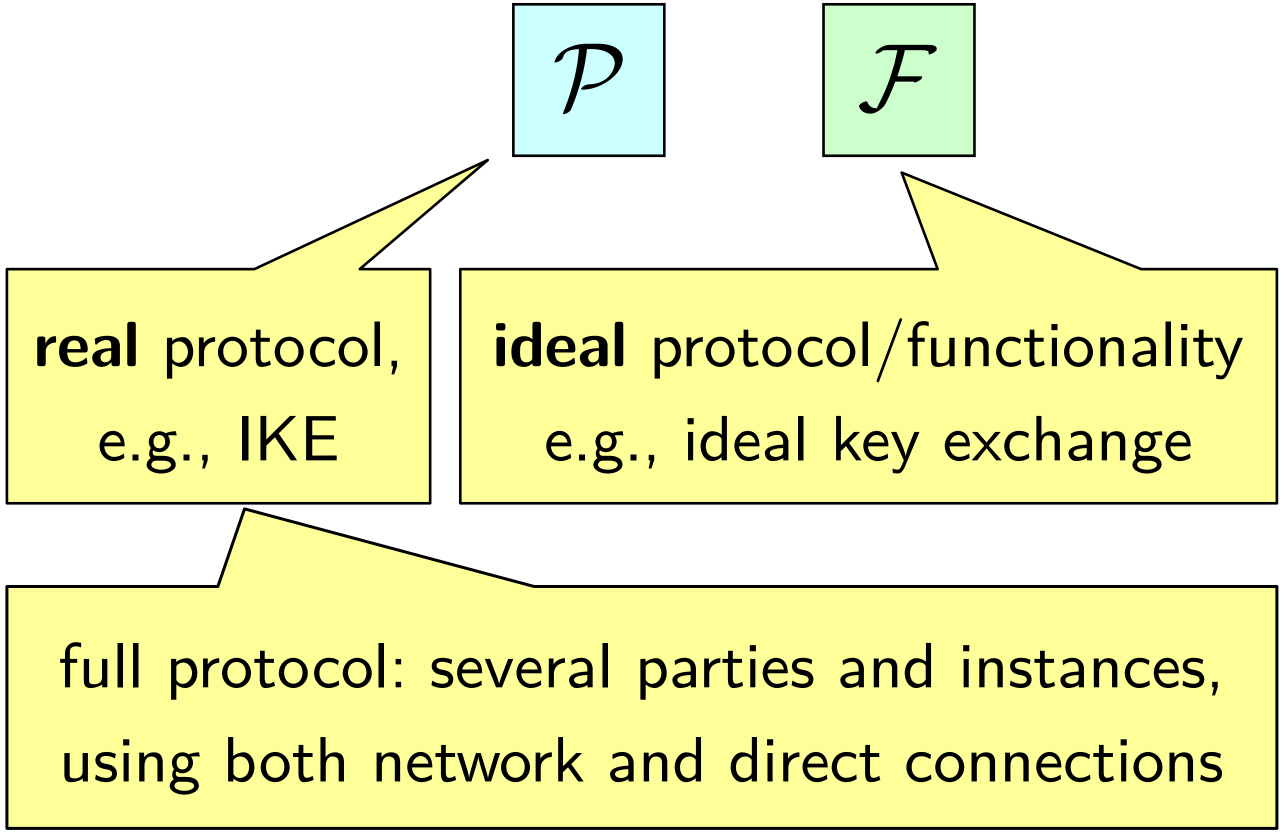

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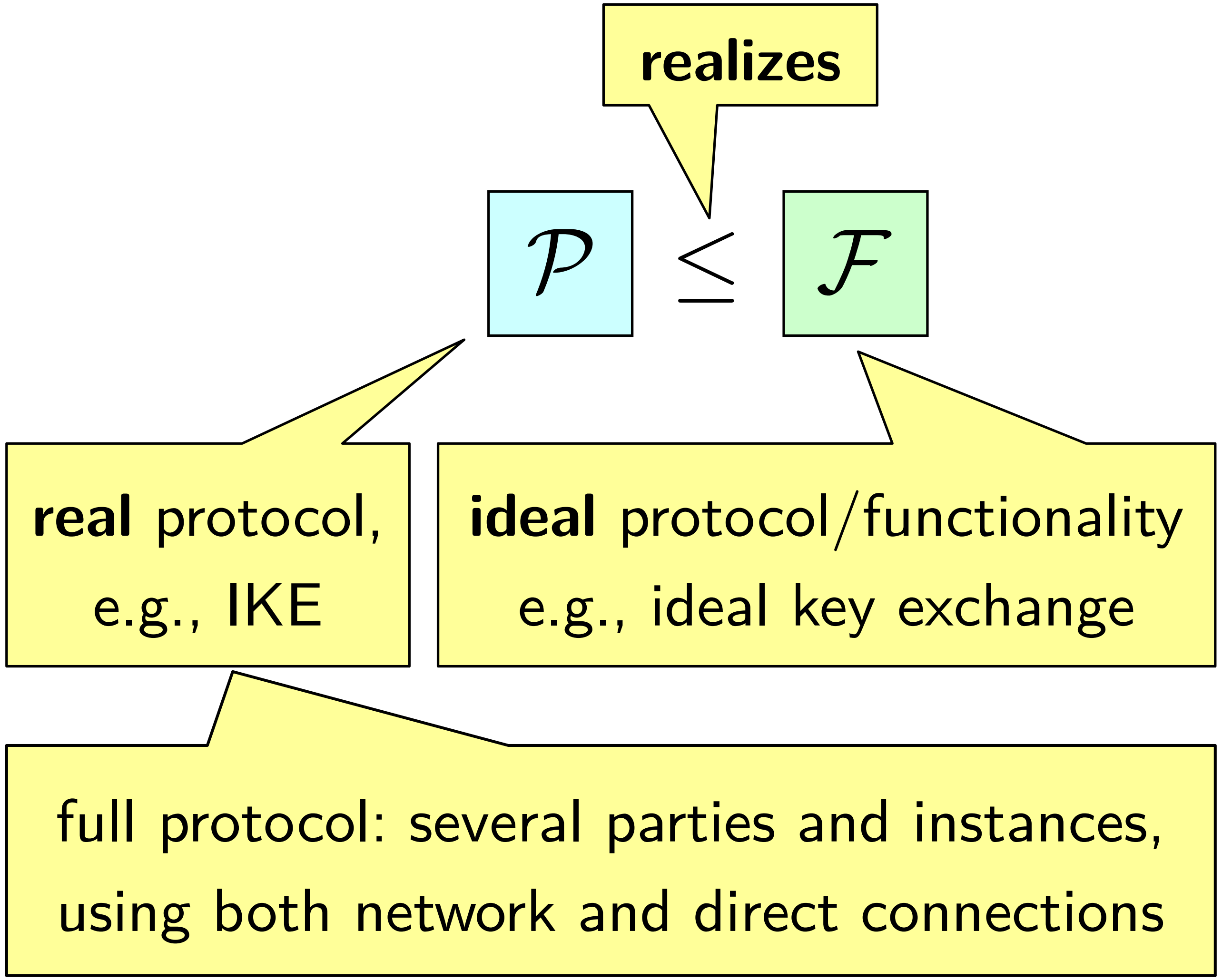

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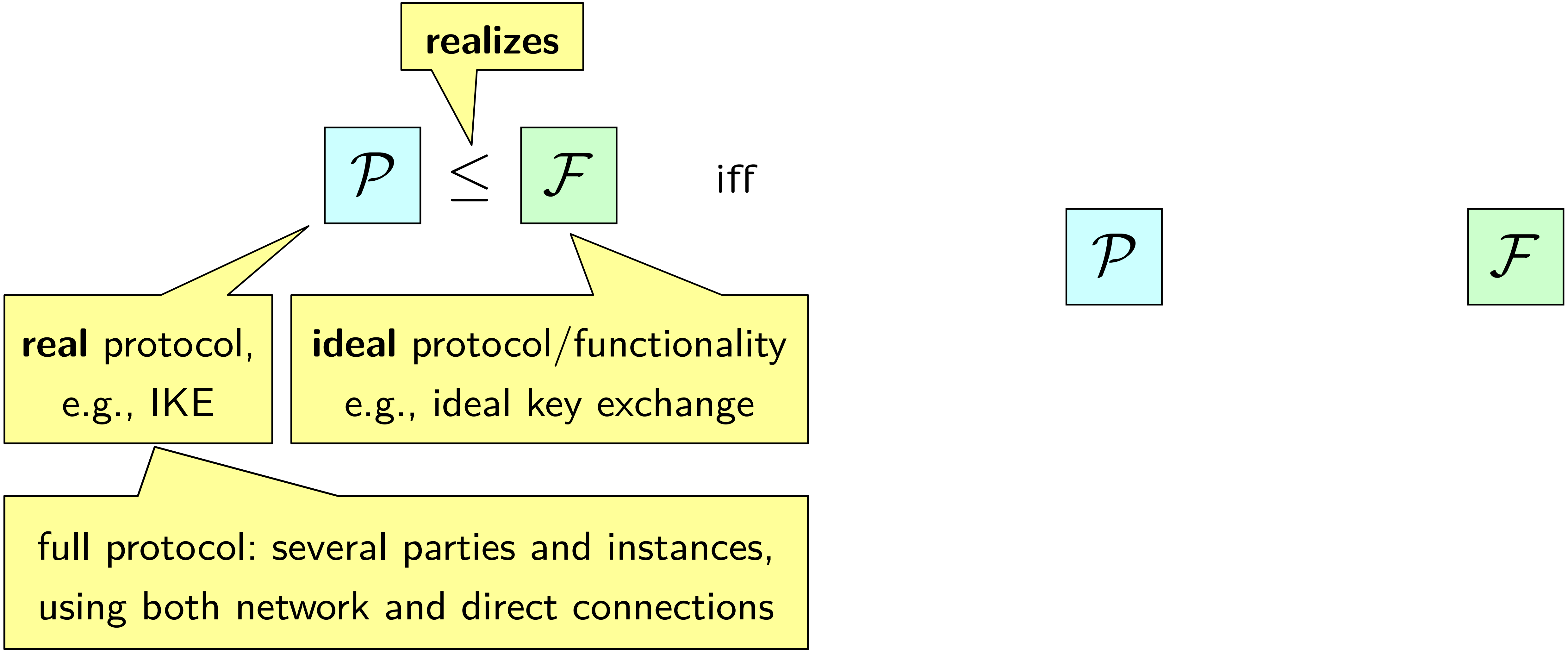

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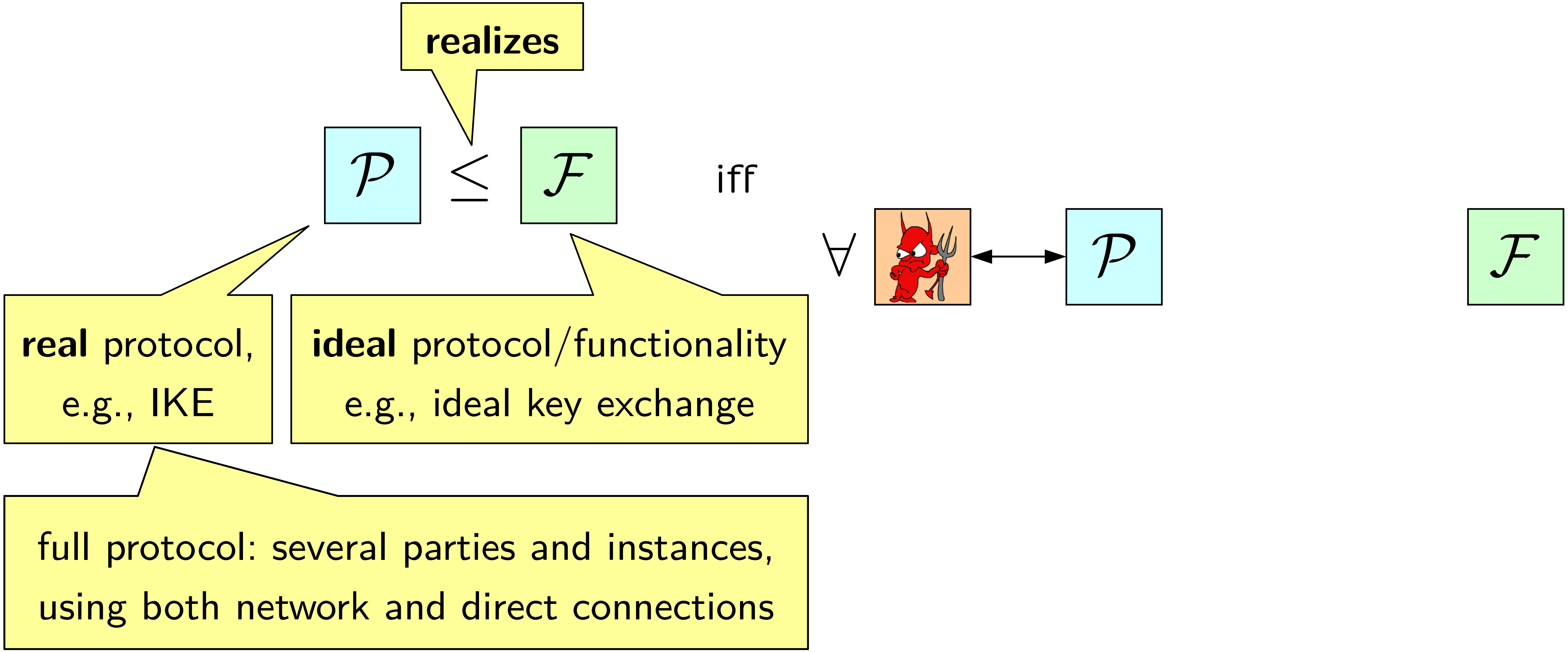

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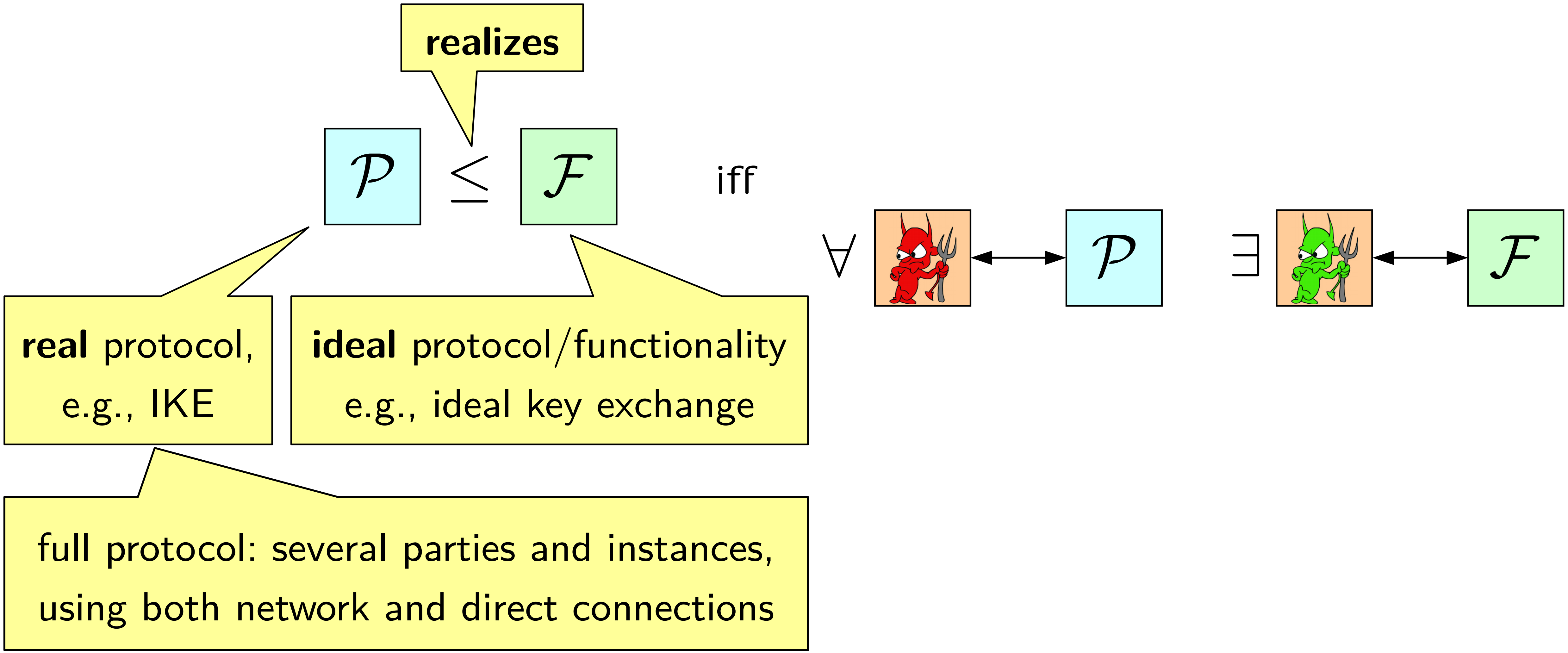

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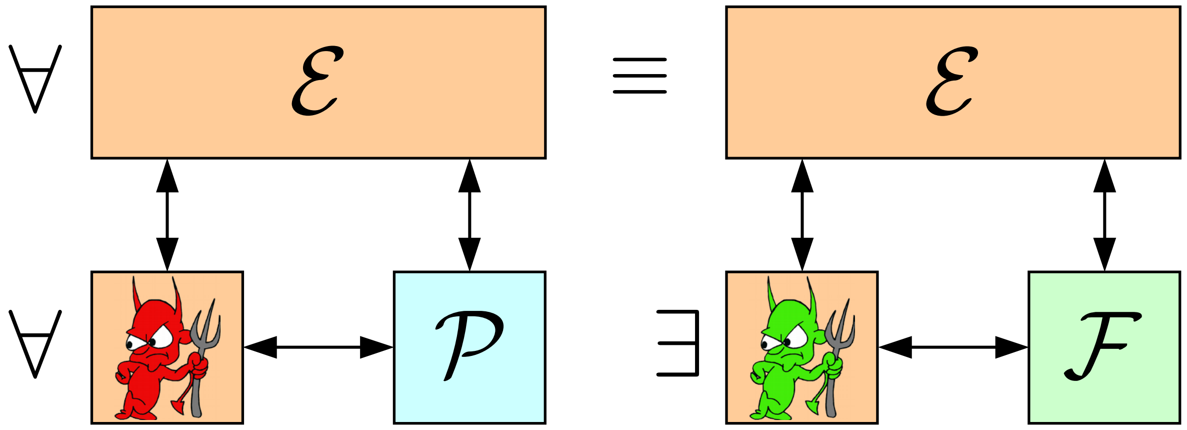

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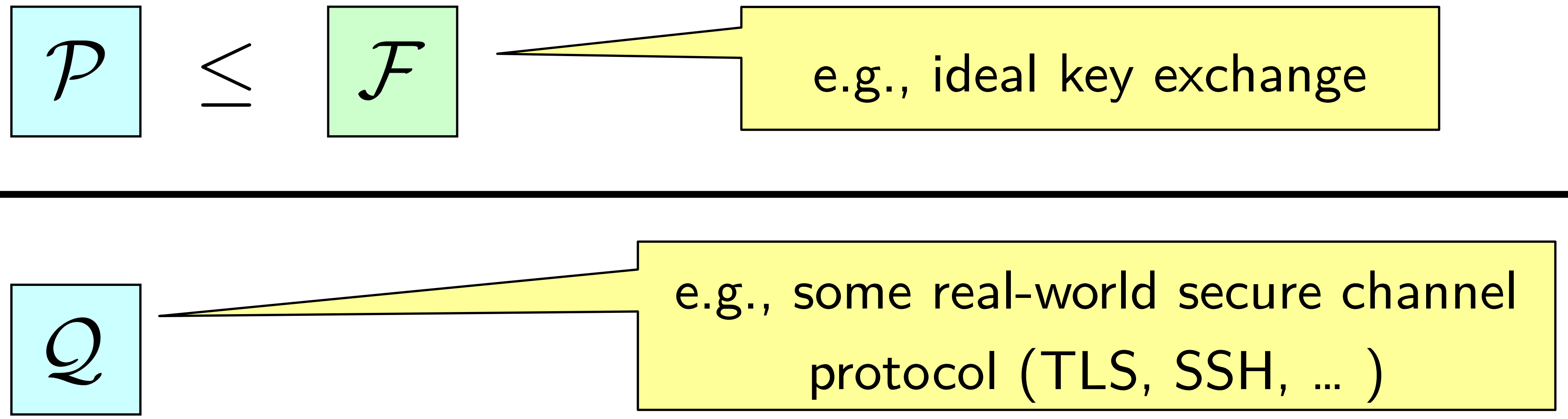

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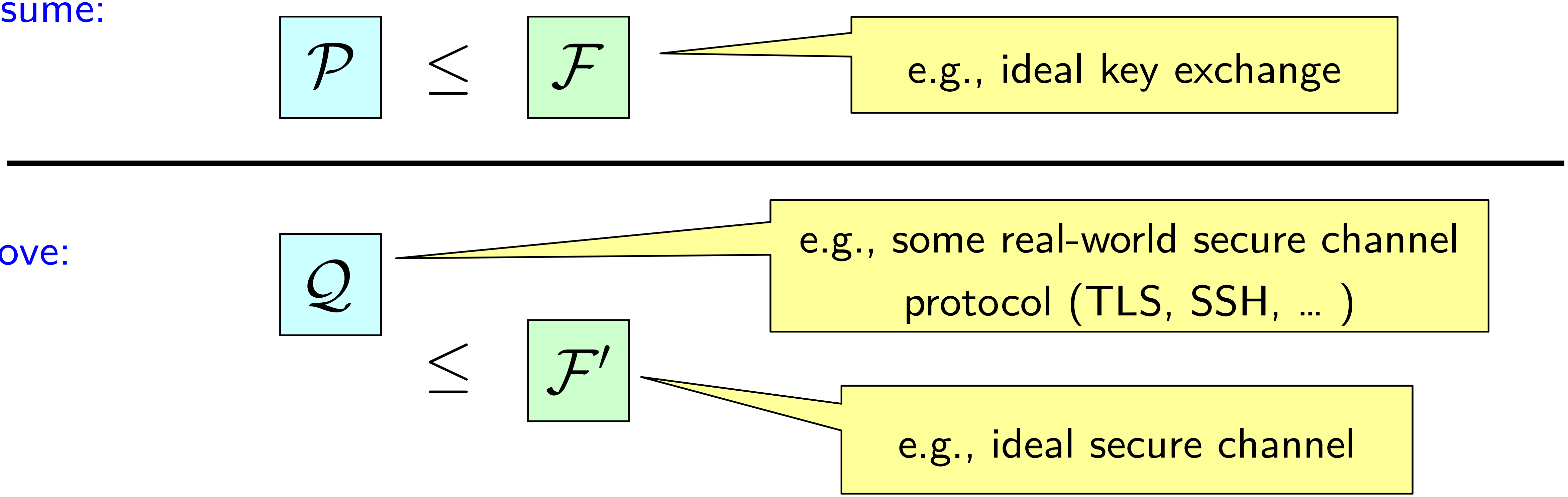

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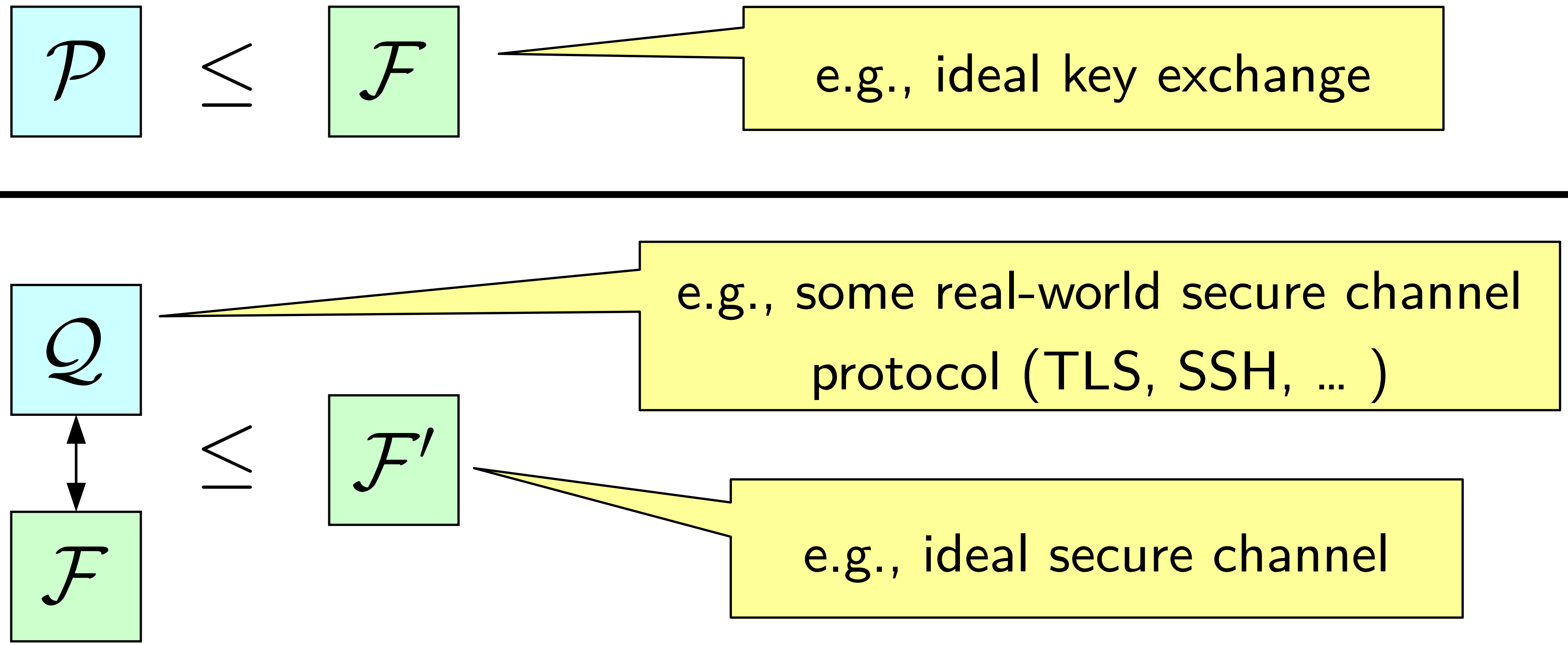

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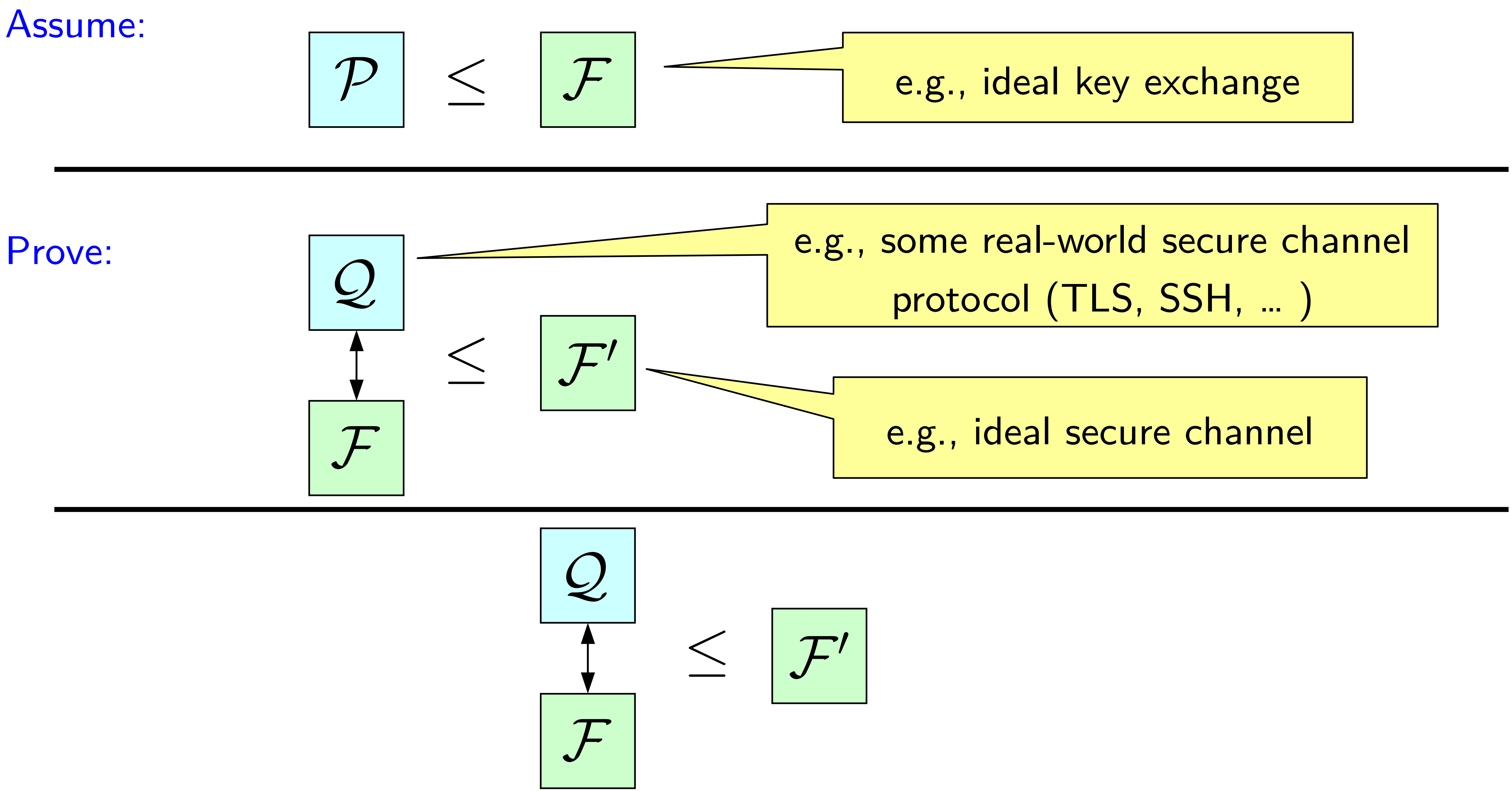

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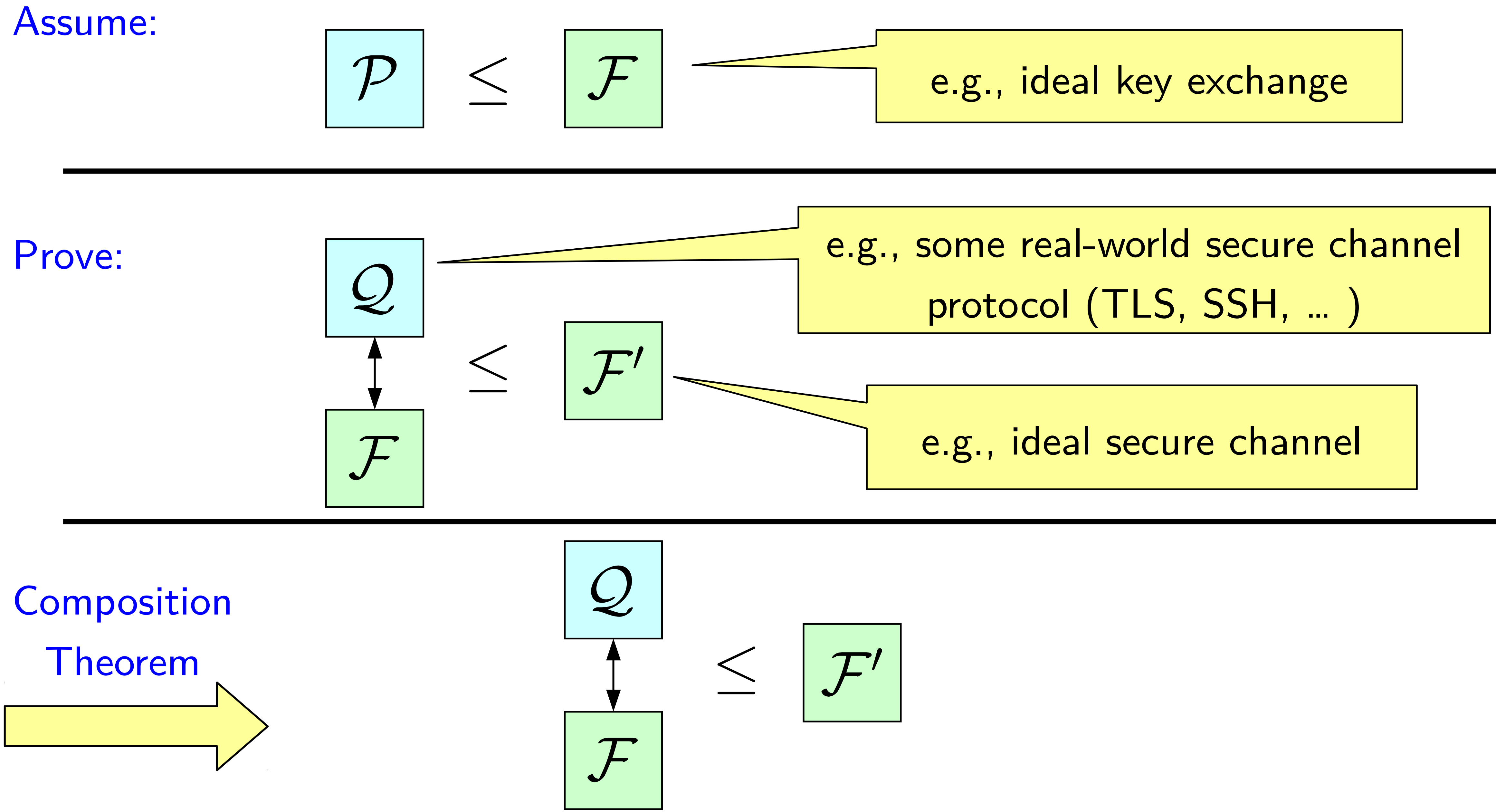

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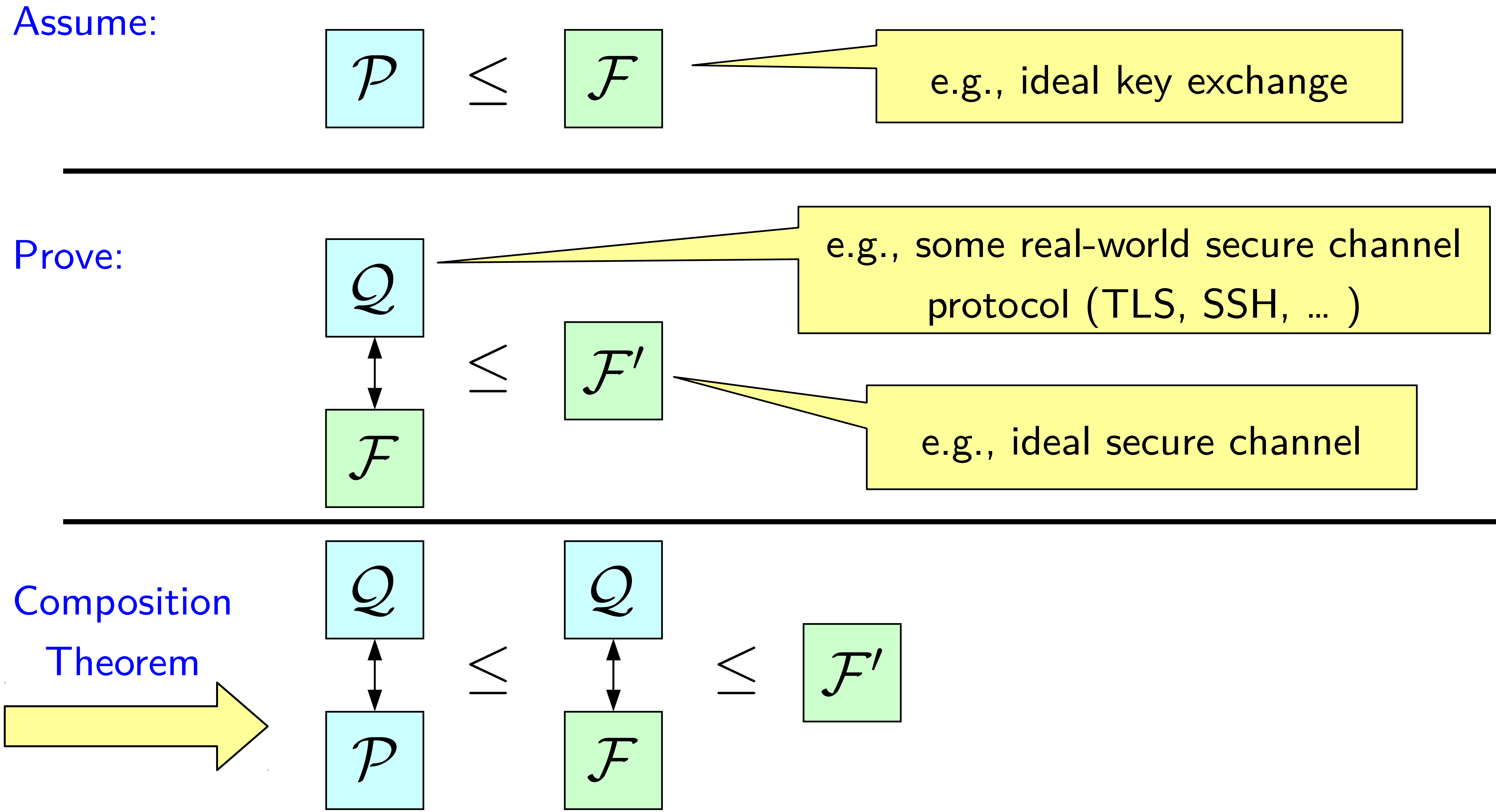

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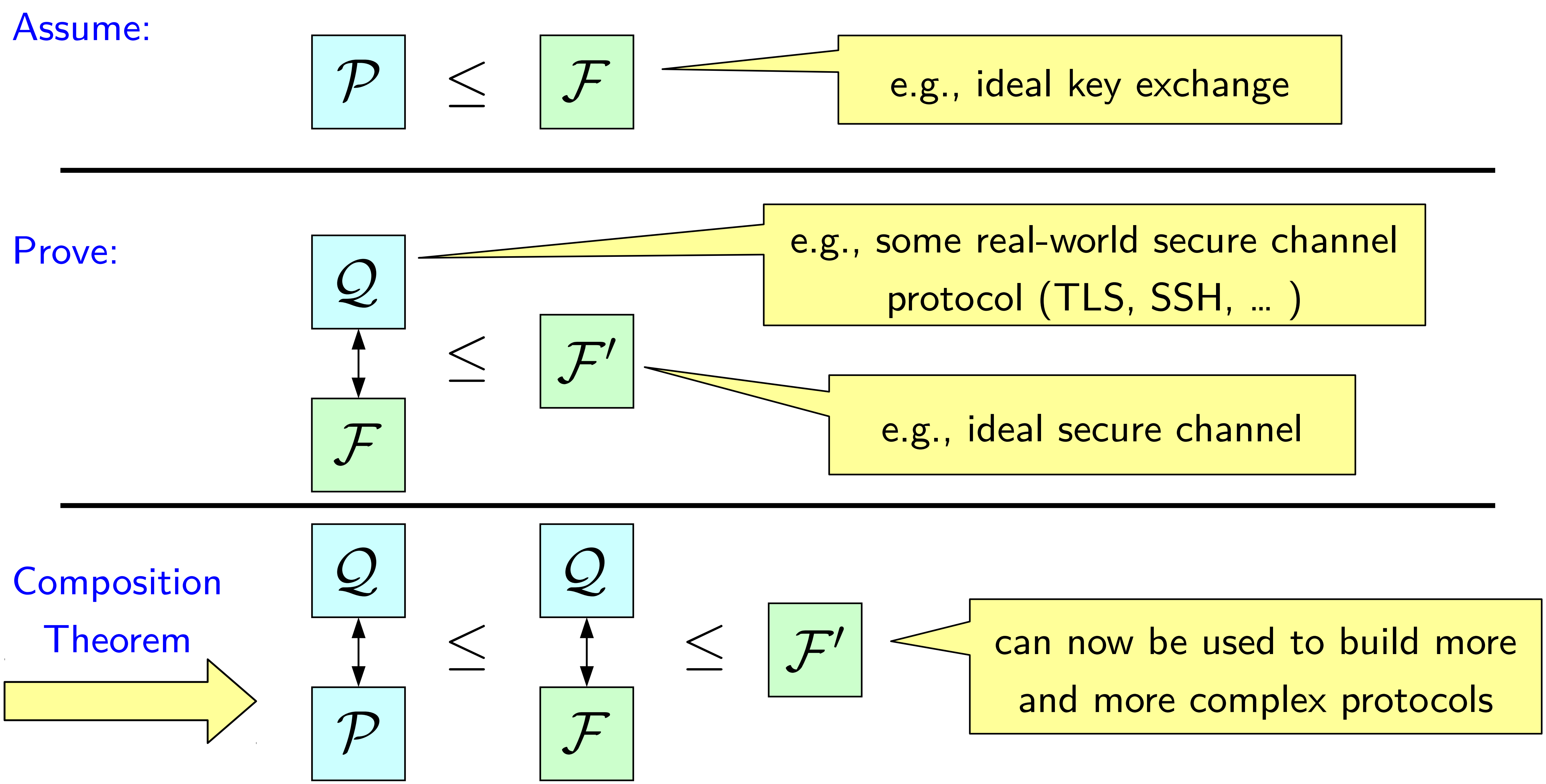

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can now be used to build more and more complex protocols

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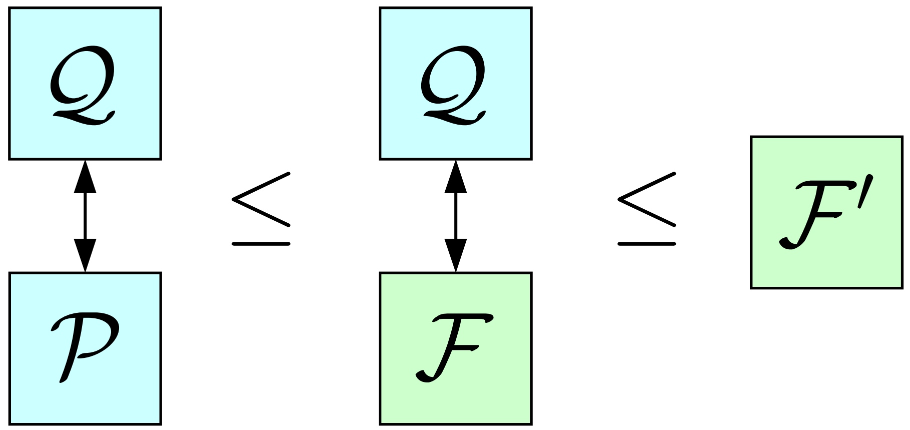

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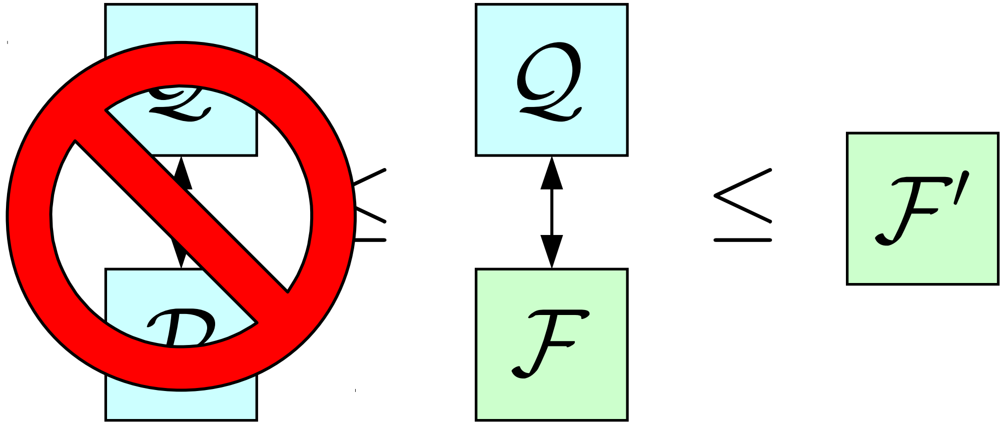

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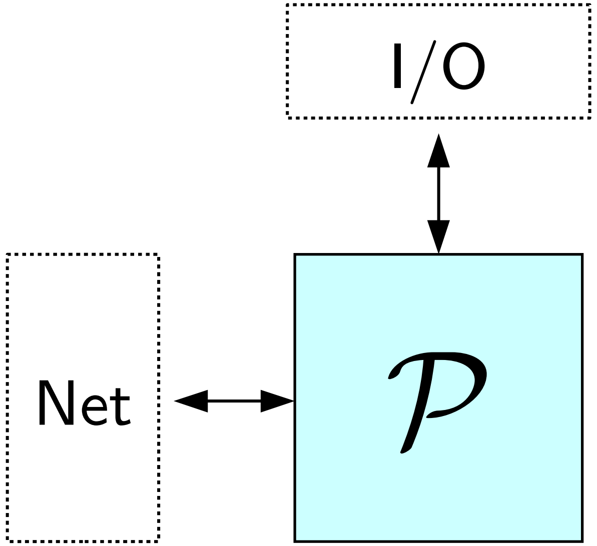

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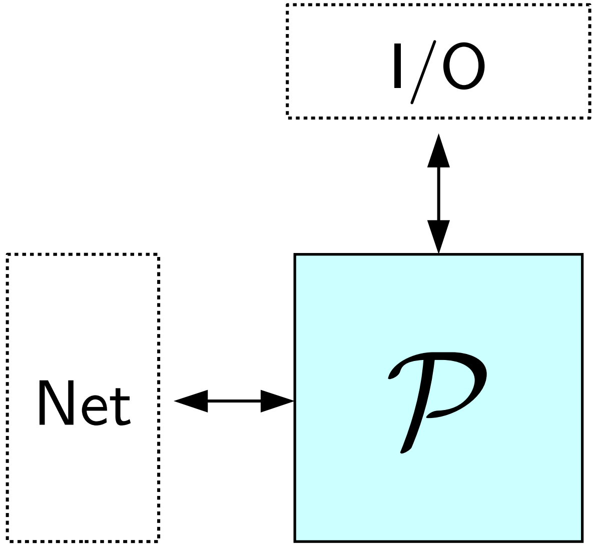

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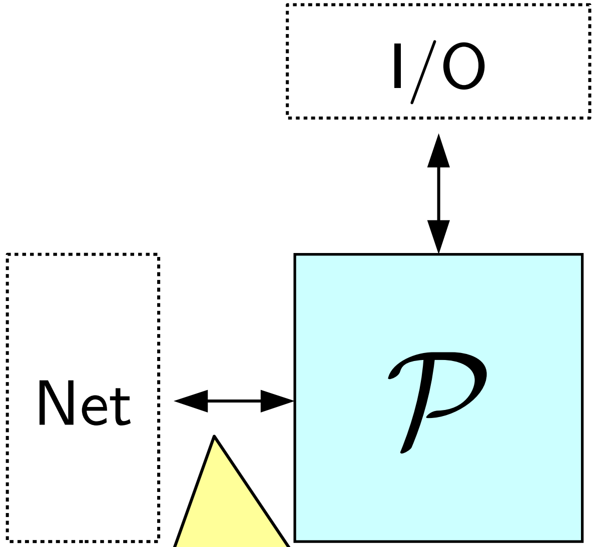

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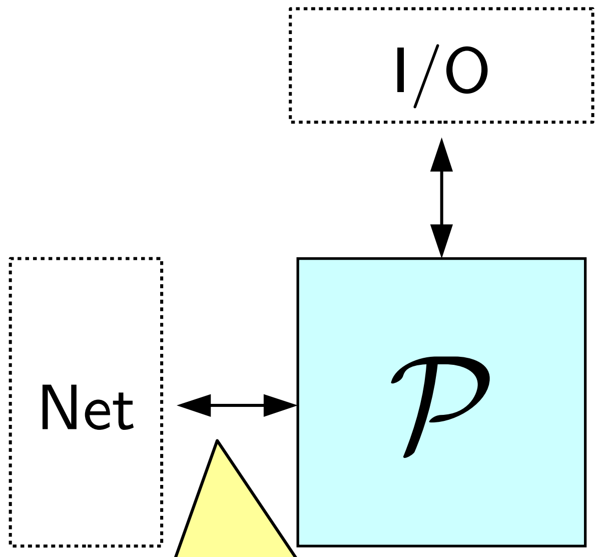

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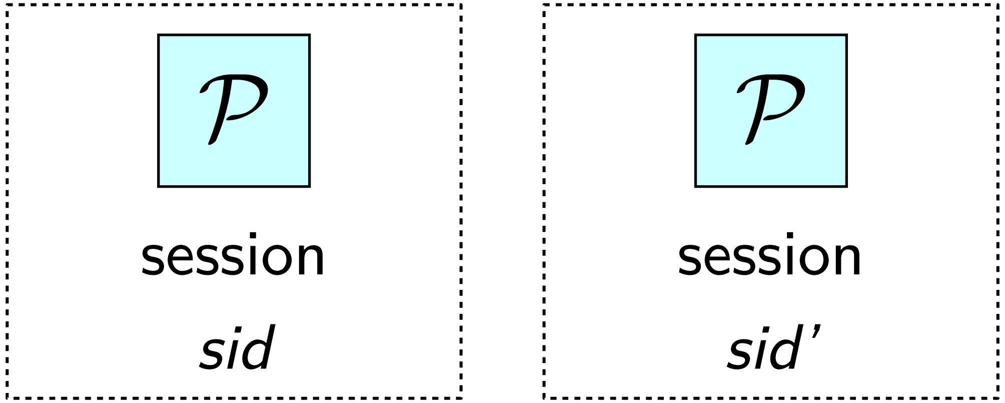

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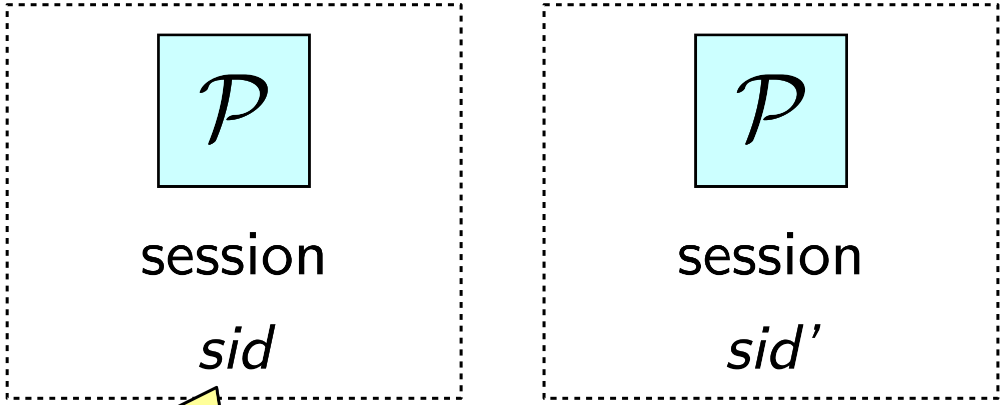

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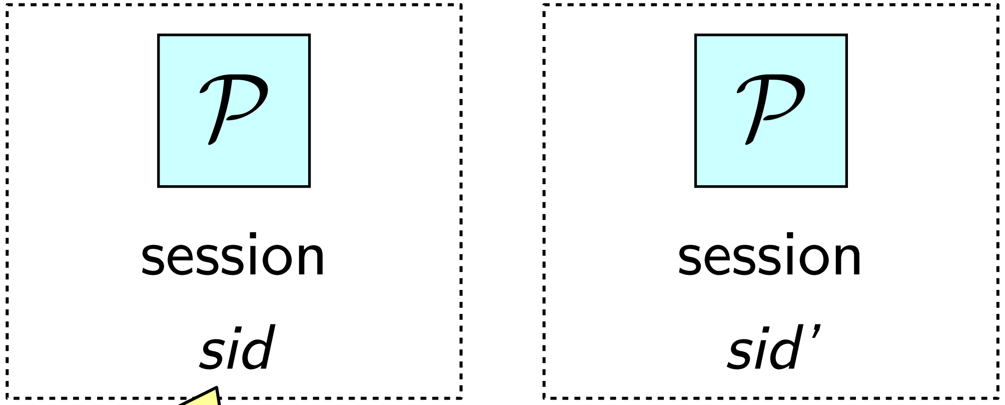

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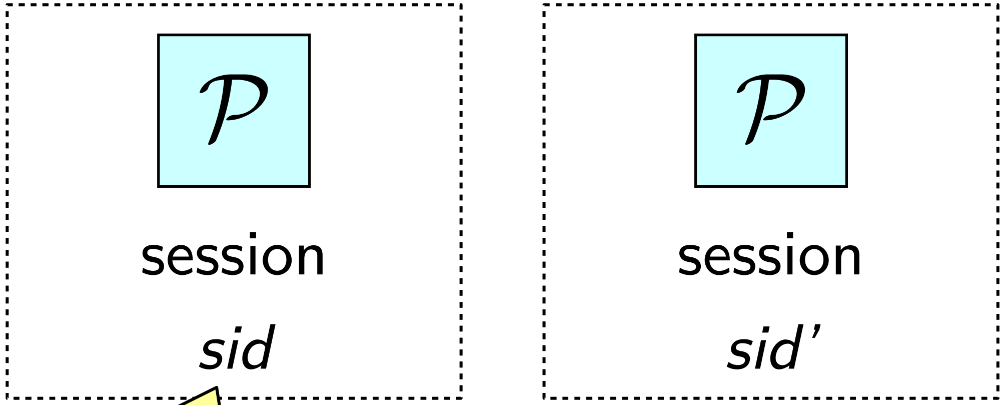

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Canetti et al.:
”We are not aware of any written proof in the UC framework that actually takes these details [of the model] into account.”

“A Simpler Variant of Universally Composable Security for Standard Multiparty Computation”, CRYPTO 2015

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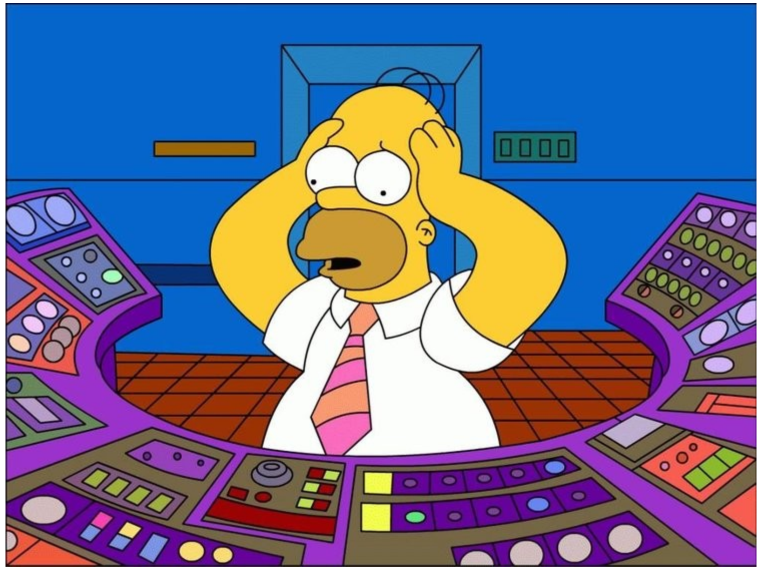

No one wants to care about these issues when analyzing a protocol!

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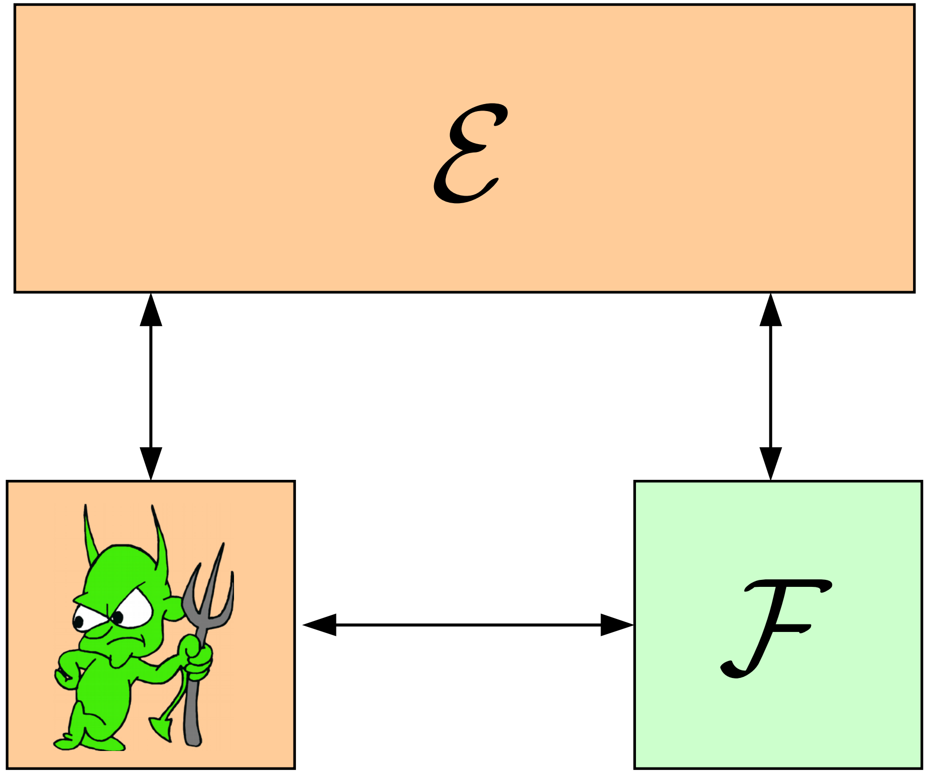

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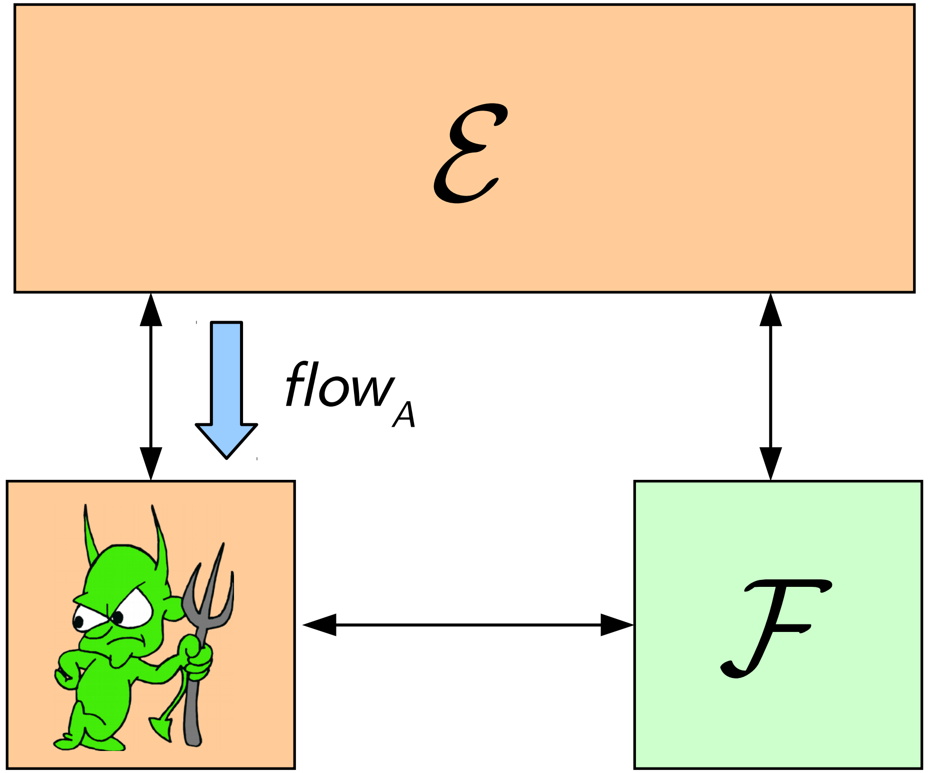

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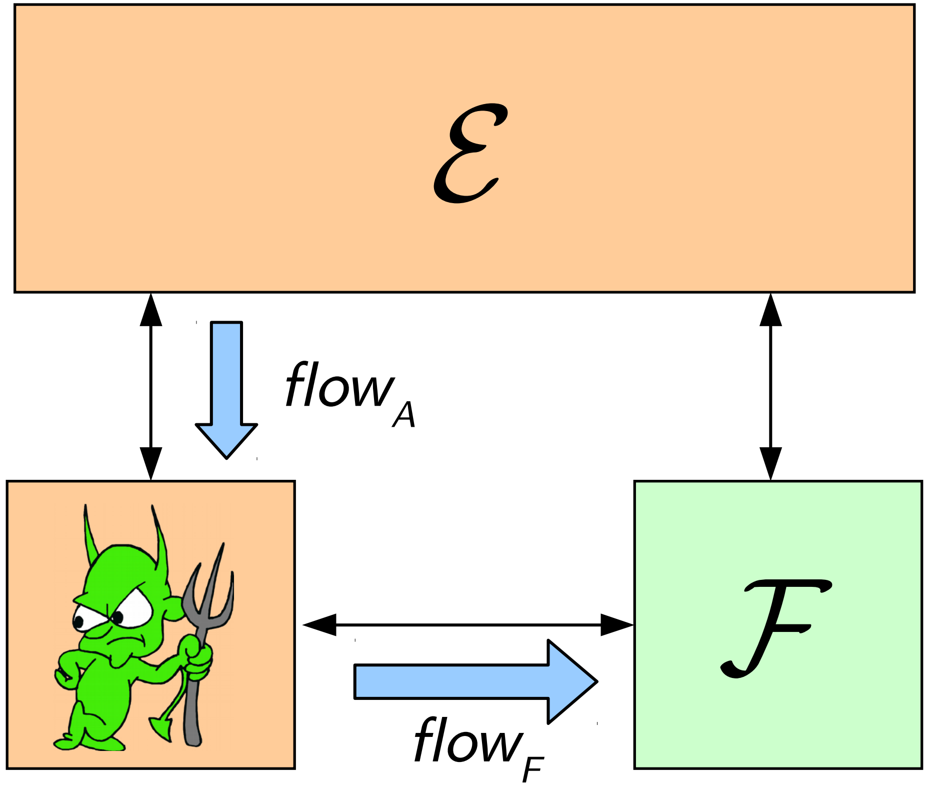

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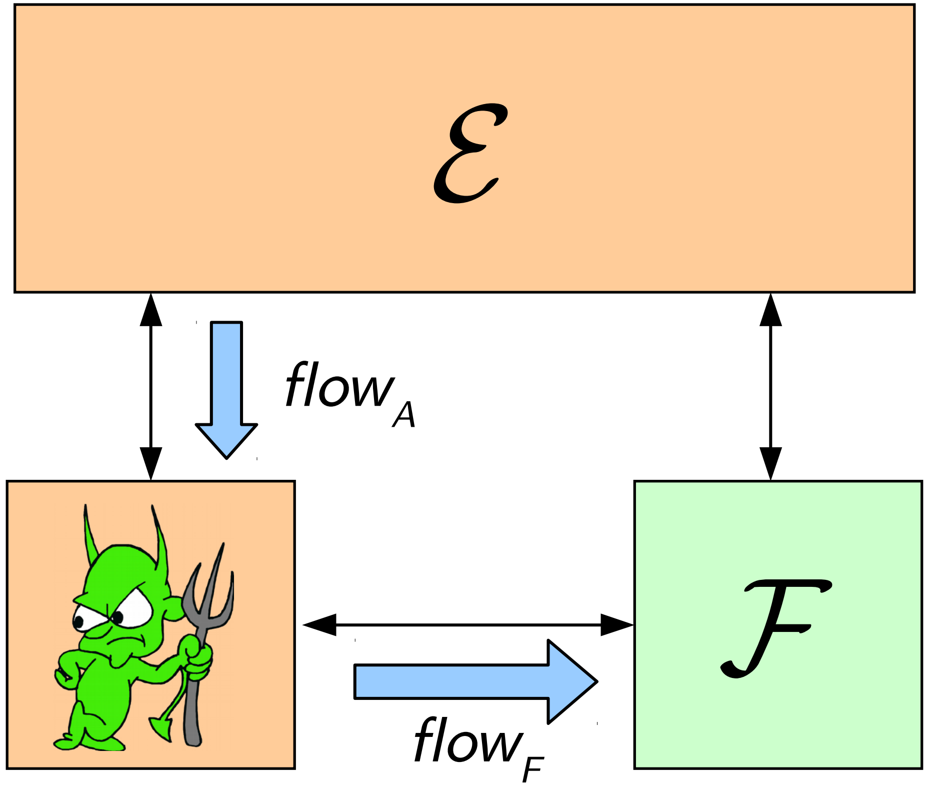

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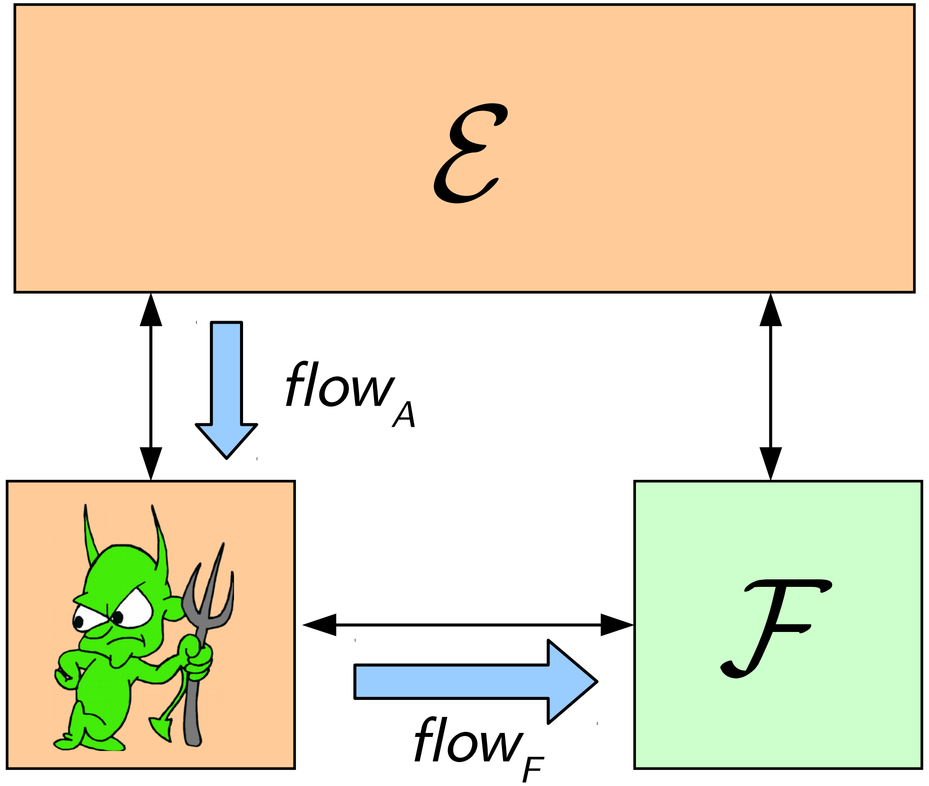

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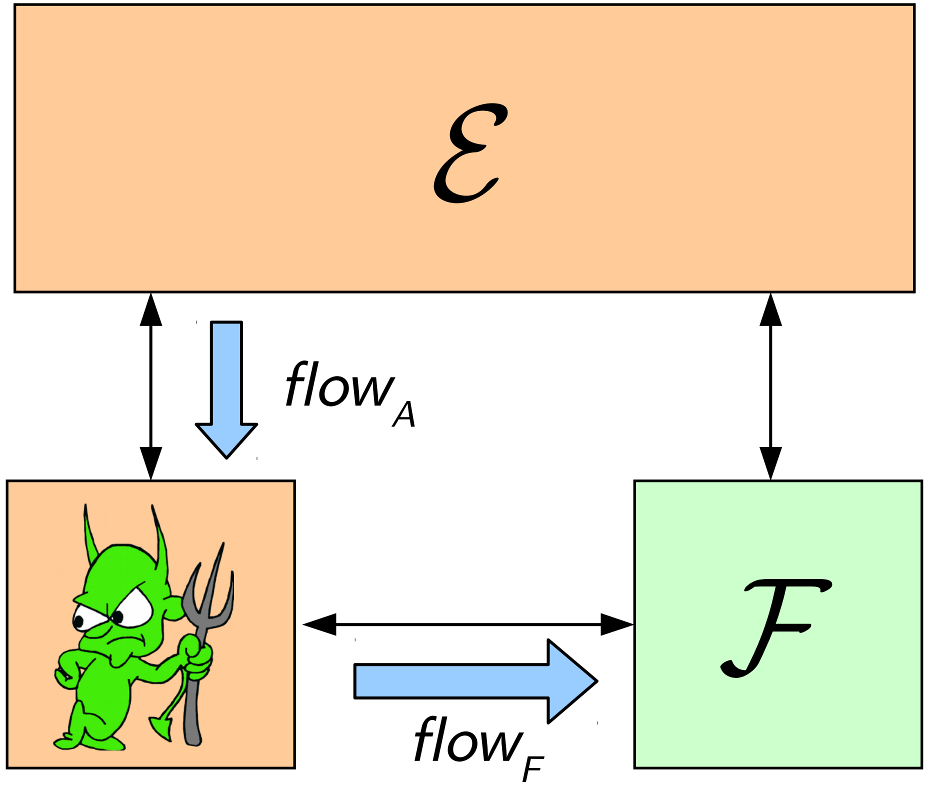

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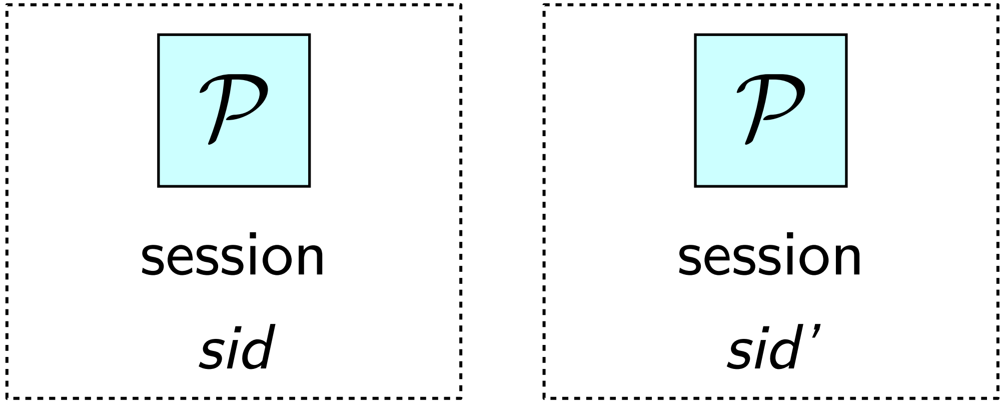

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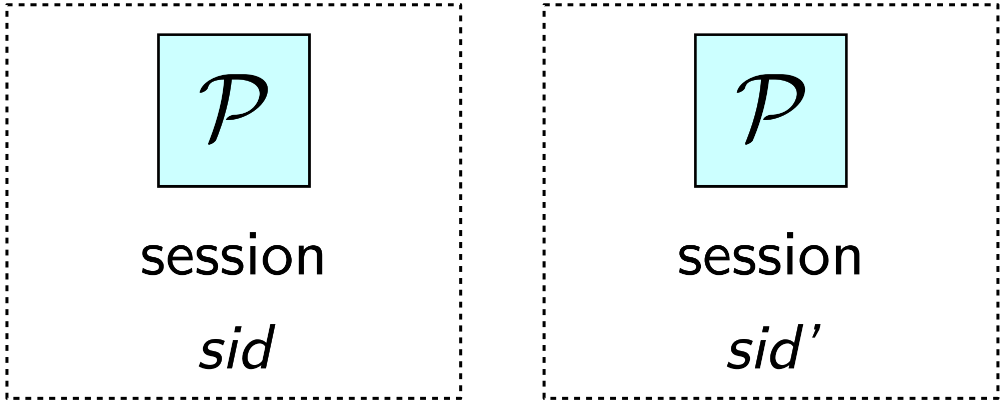

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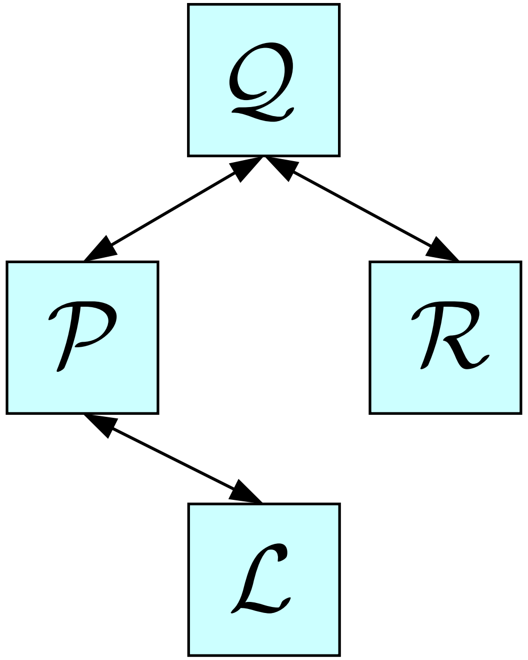

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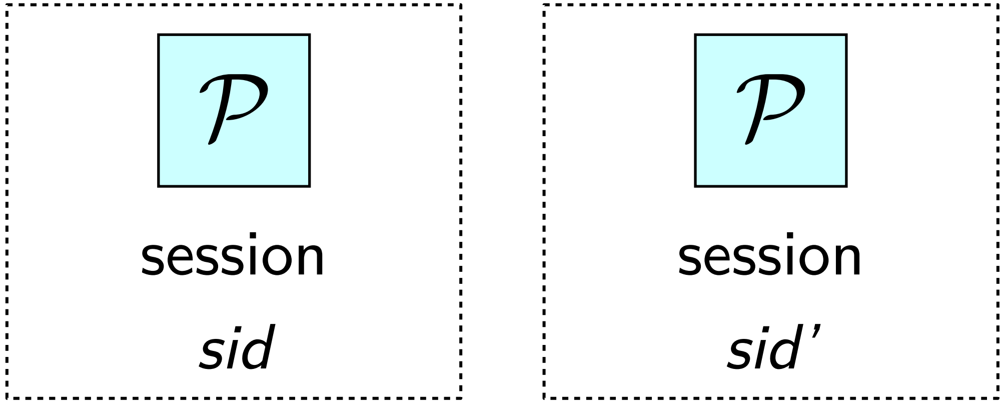

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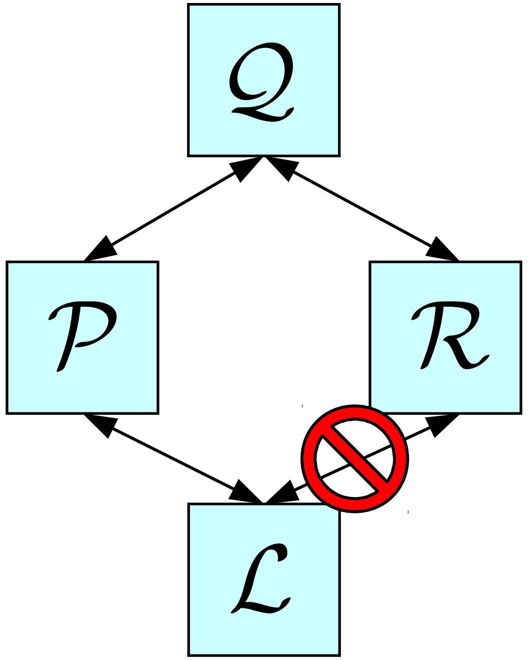

GNUC Model

The GNUC model was developed as a formally sound alternative to the UC model.

However, it is still not a perfect model:

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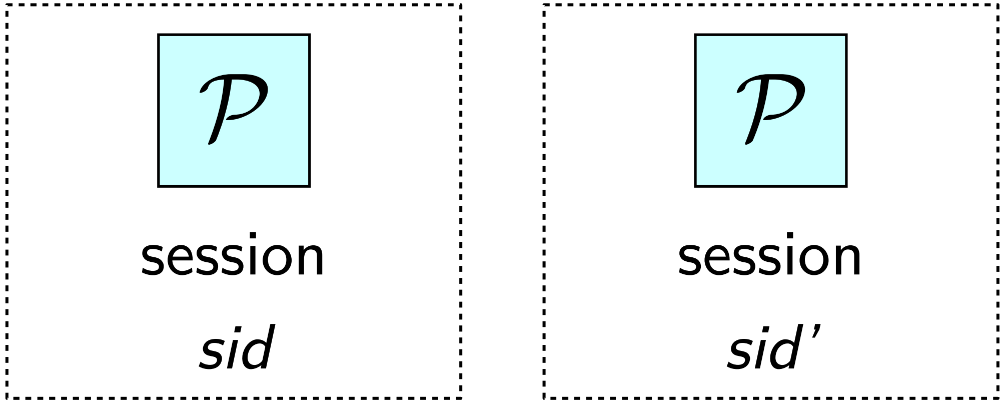
Example 1: global SIDs (as in UC)



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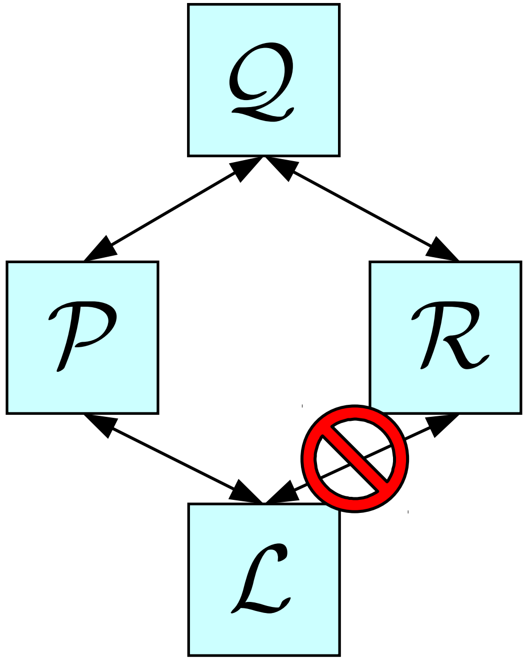

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sound model, but rather rigid structure

Universal Composability Models

- UC model [Canetti 2001] 🚫
- GNUC model [Hofheinz, Shoup 2011]
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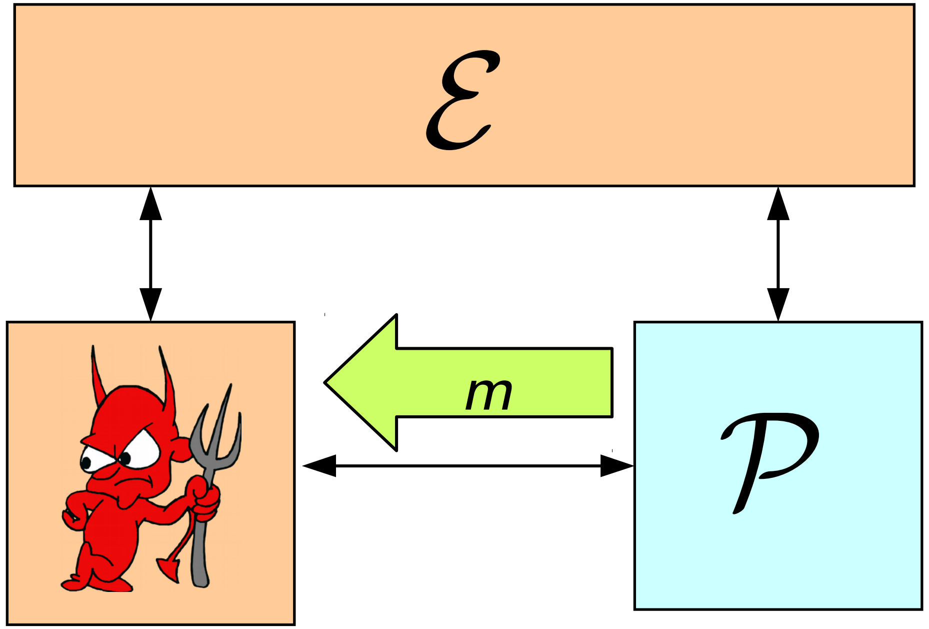

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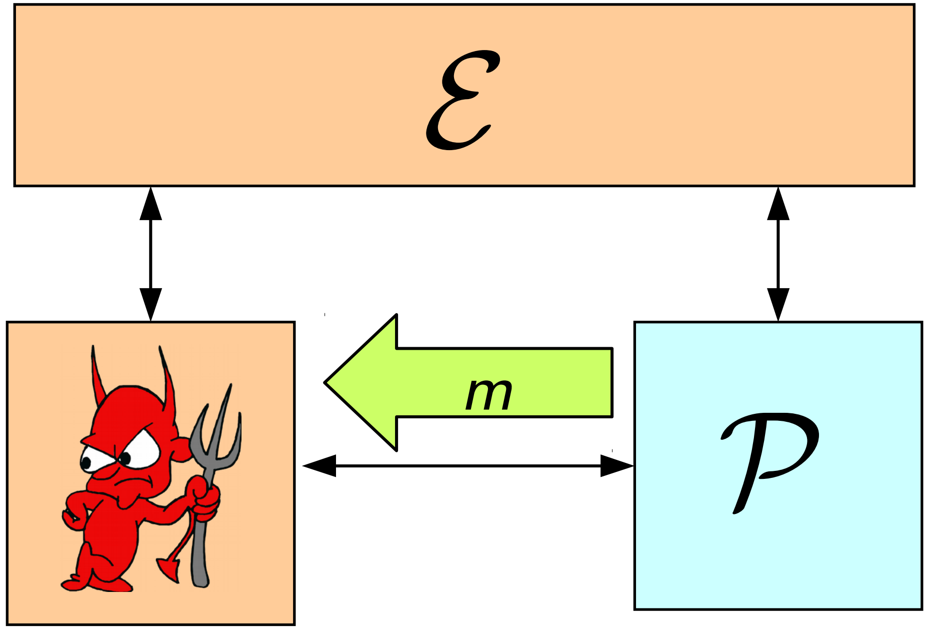

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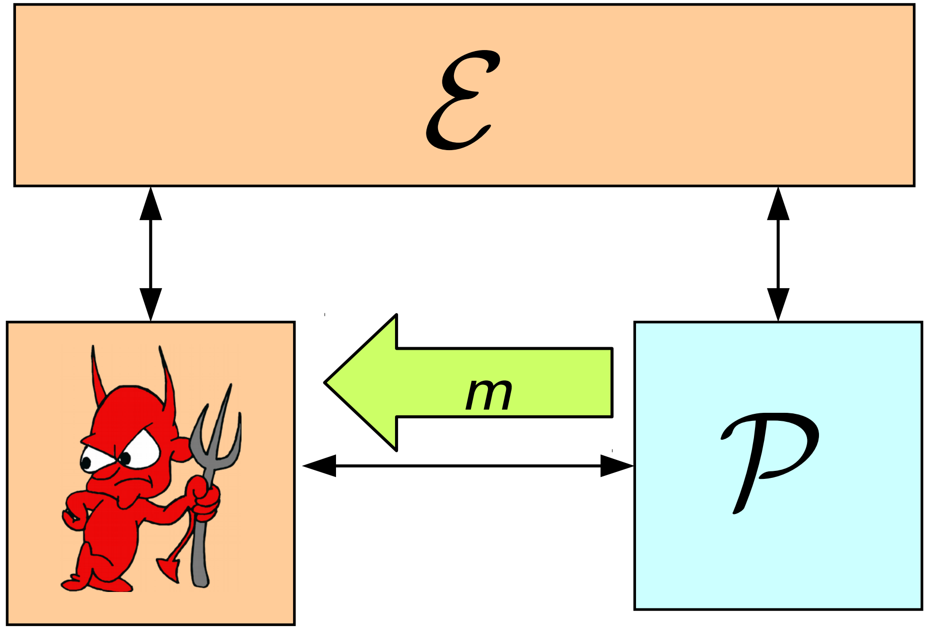

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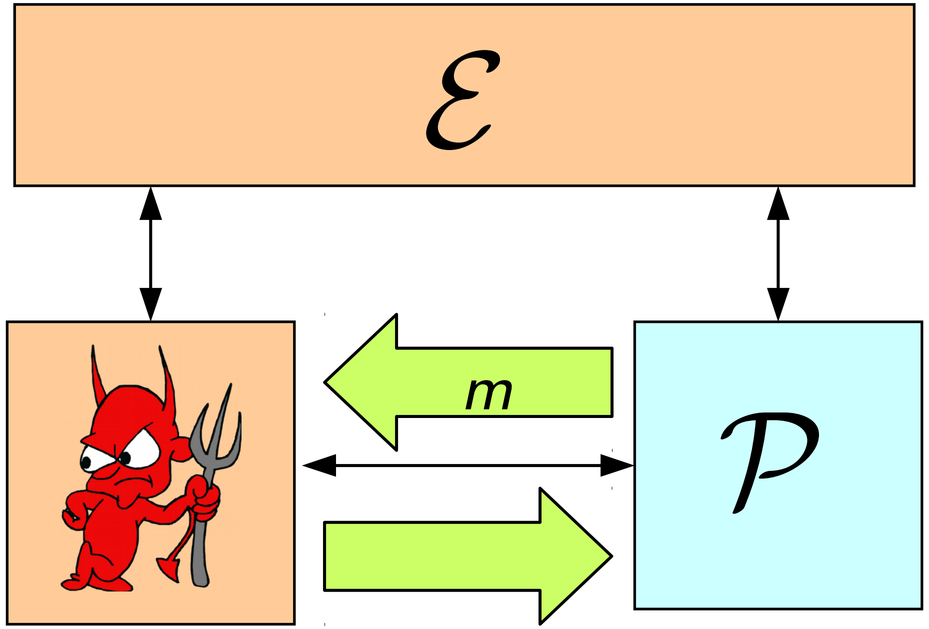

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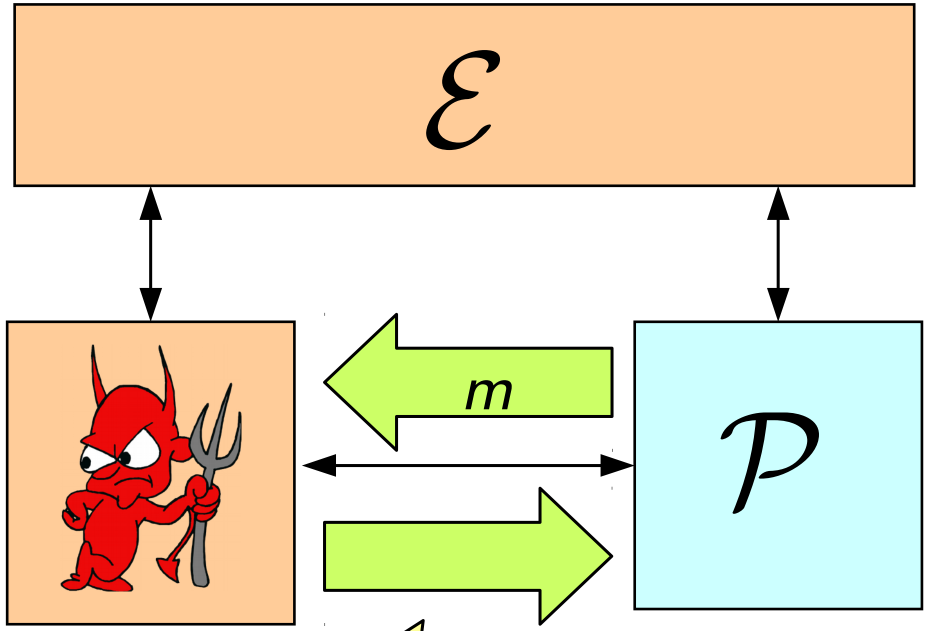

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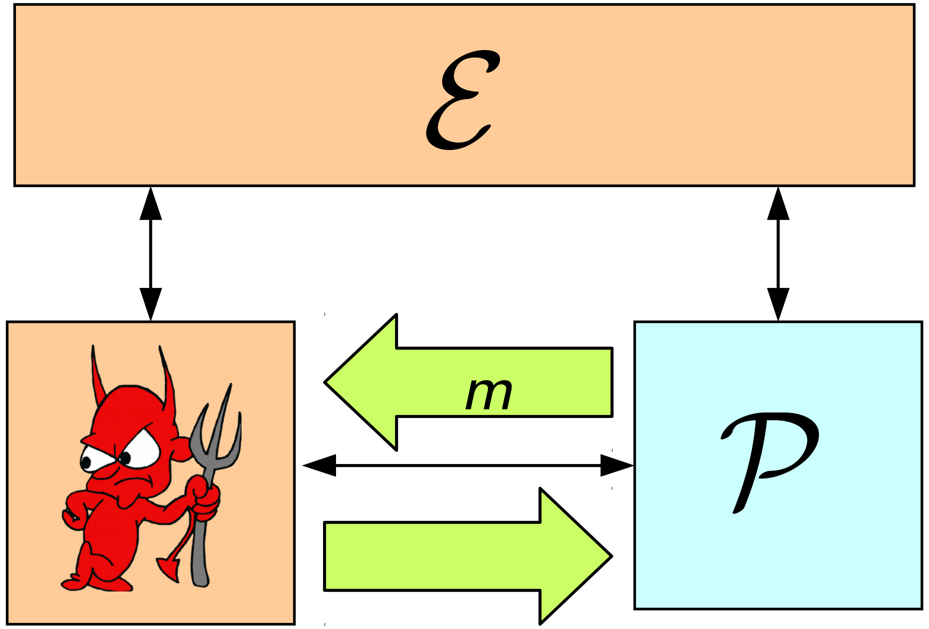

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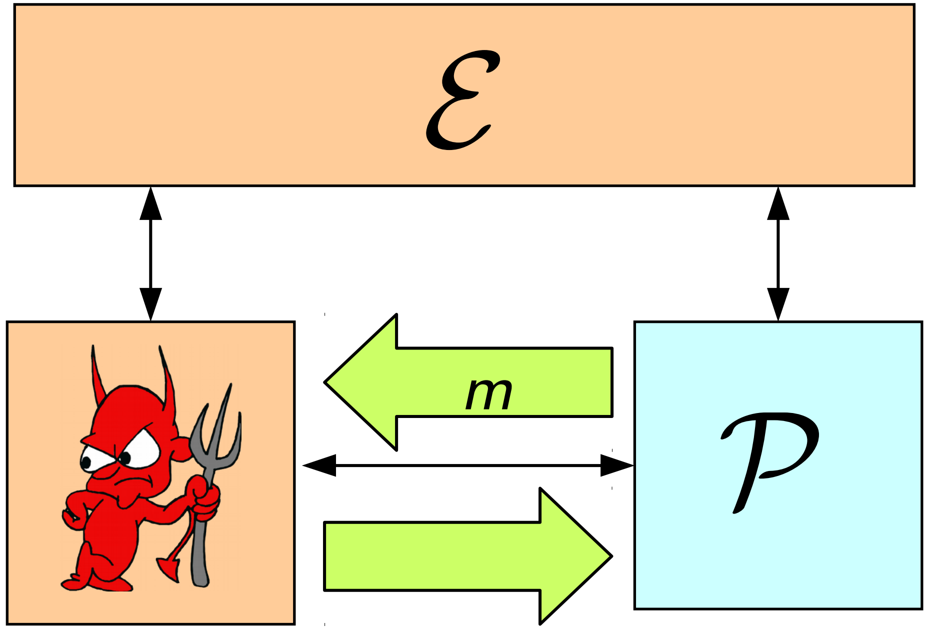

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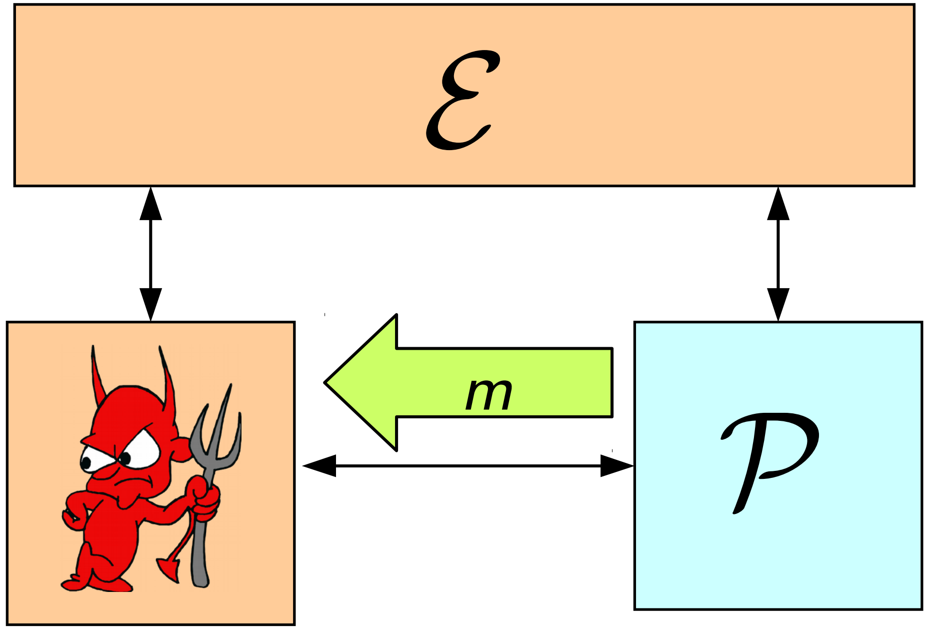

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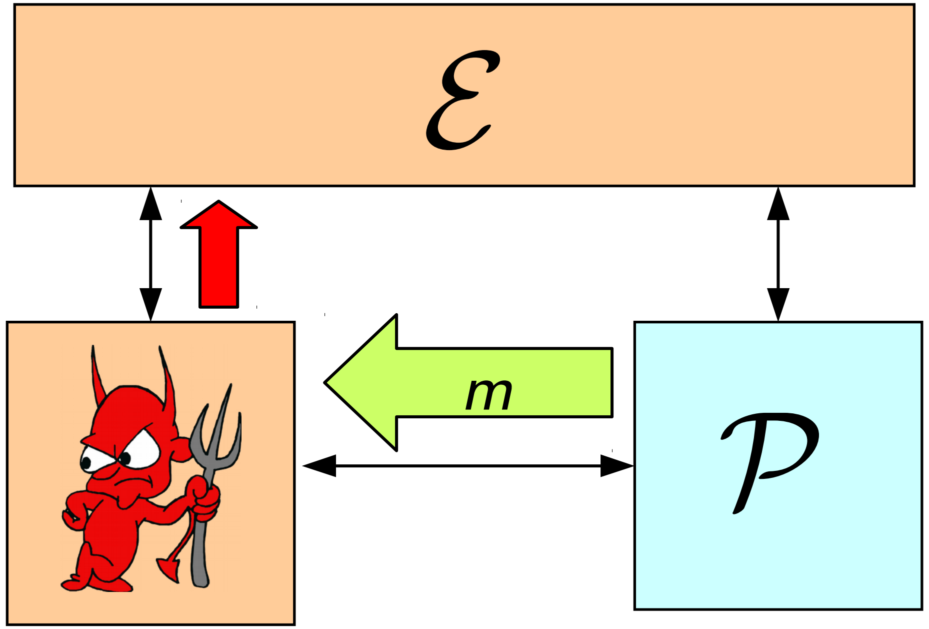

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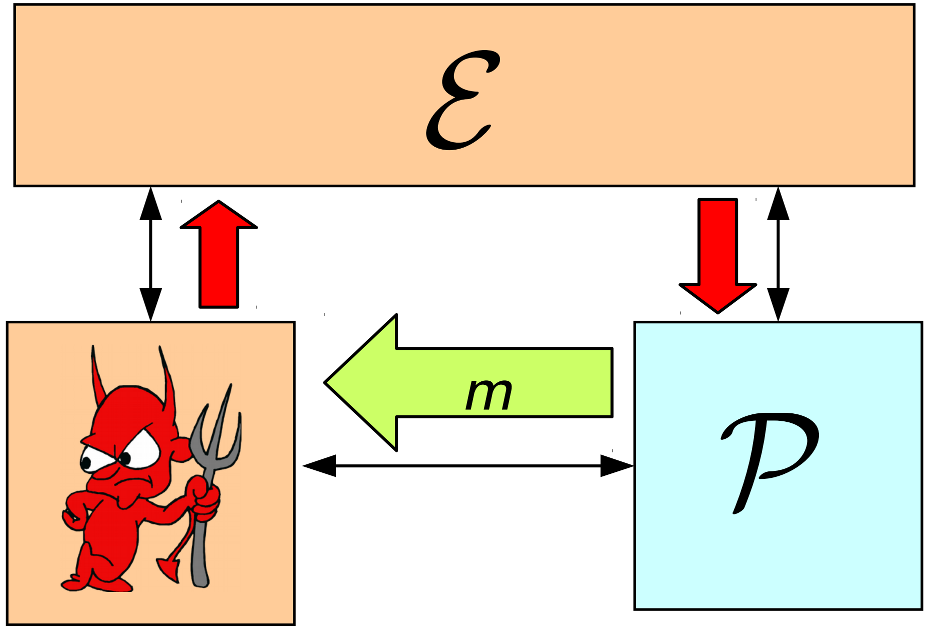

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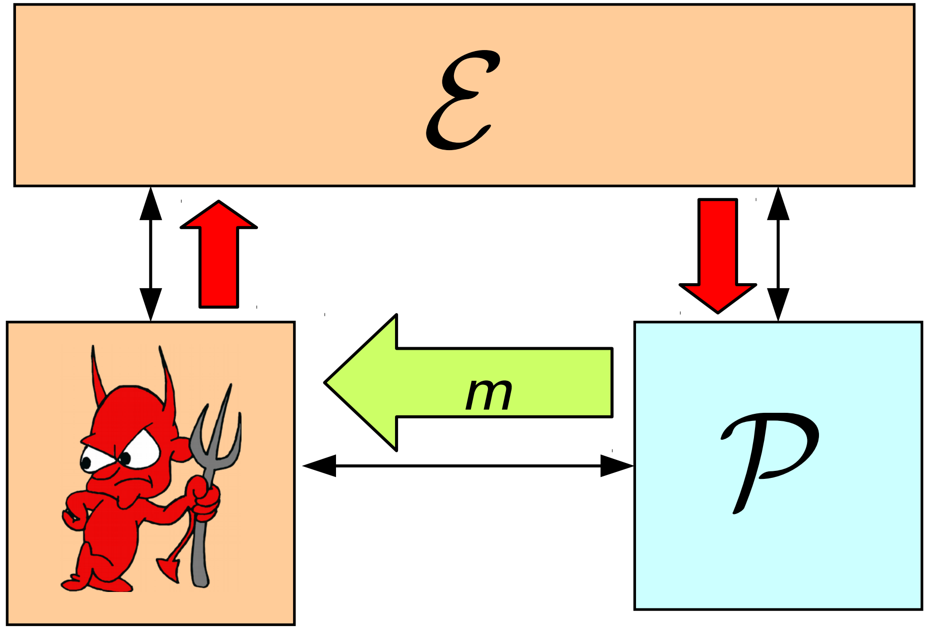

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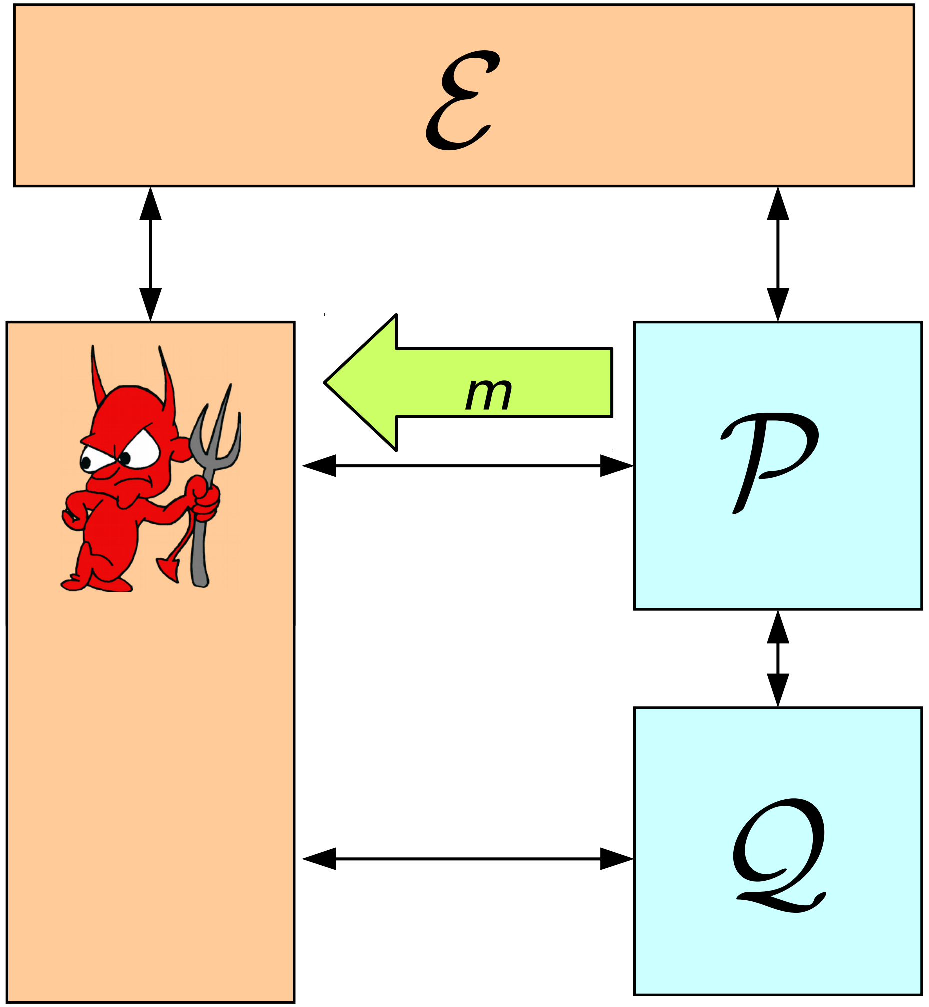

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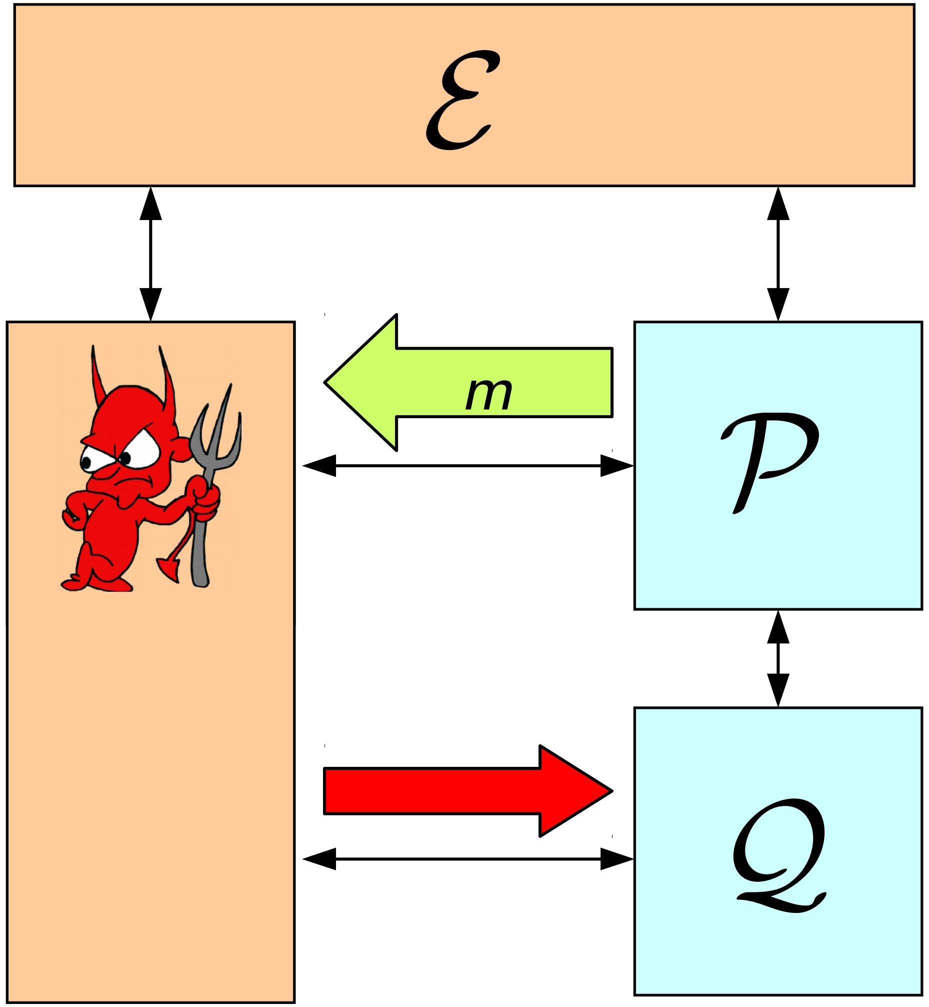

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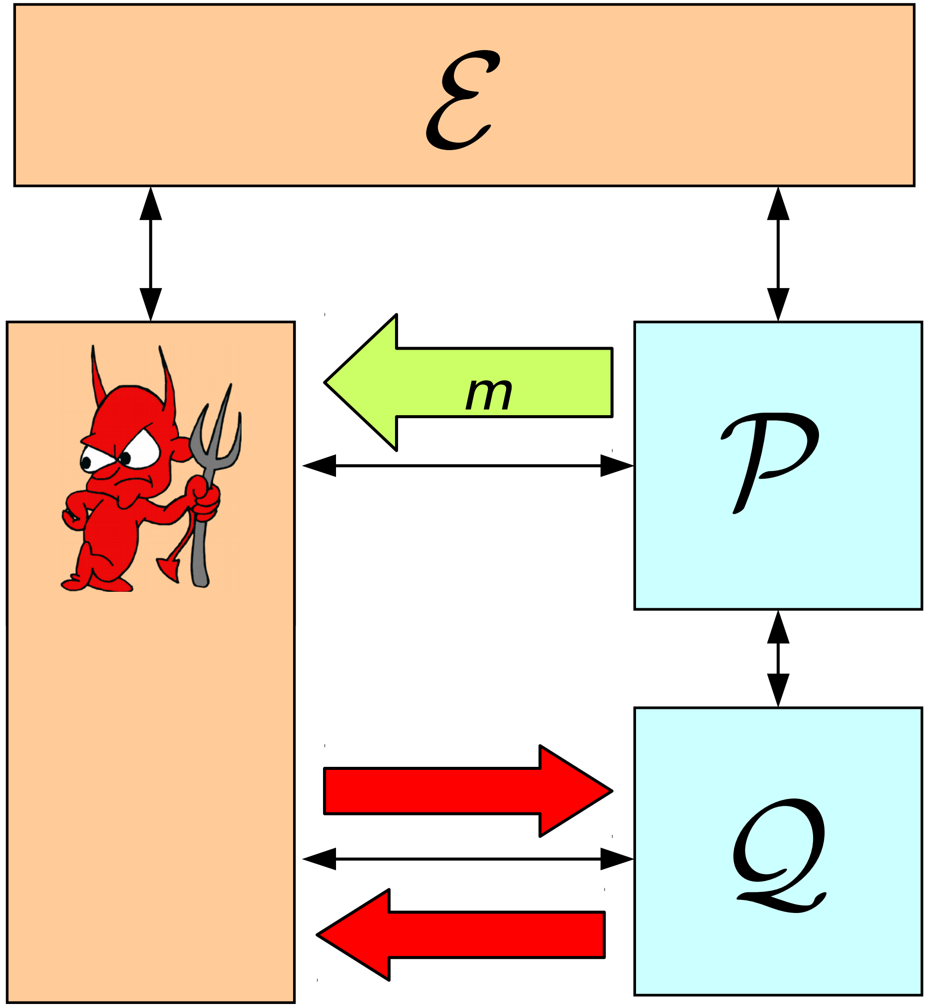

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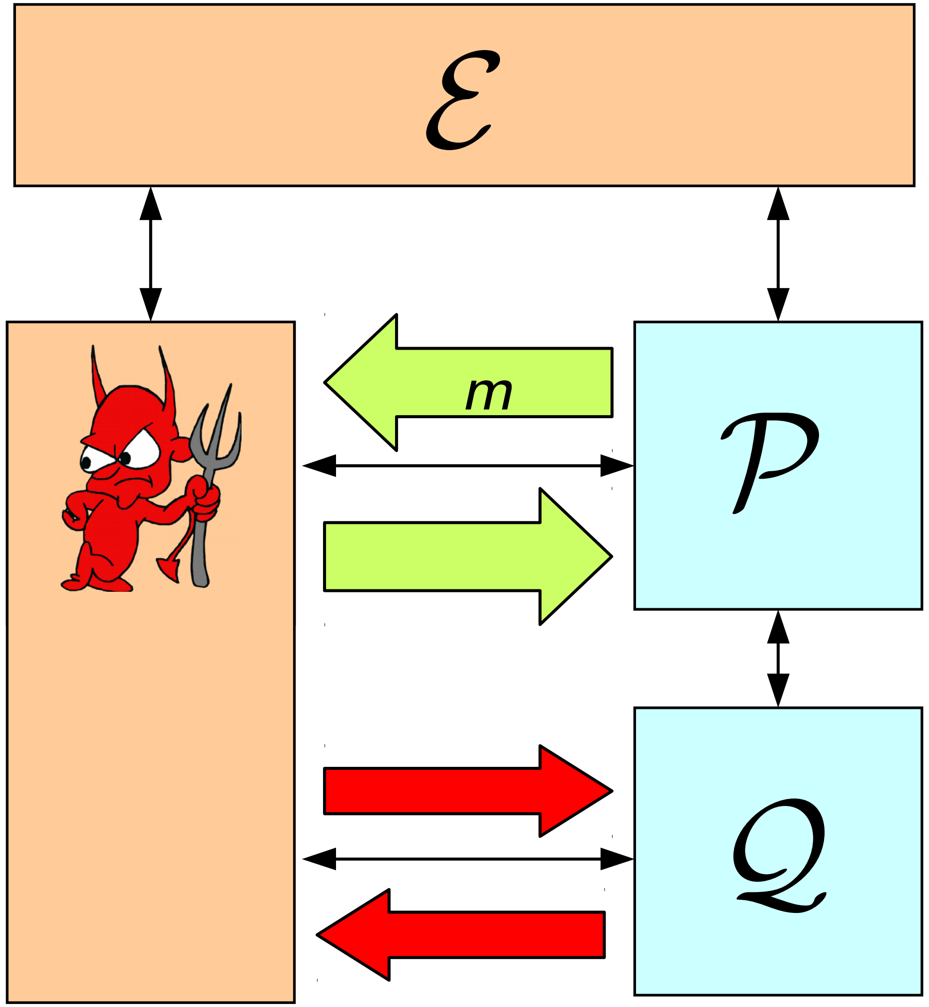

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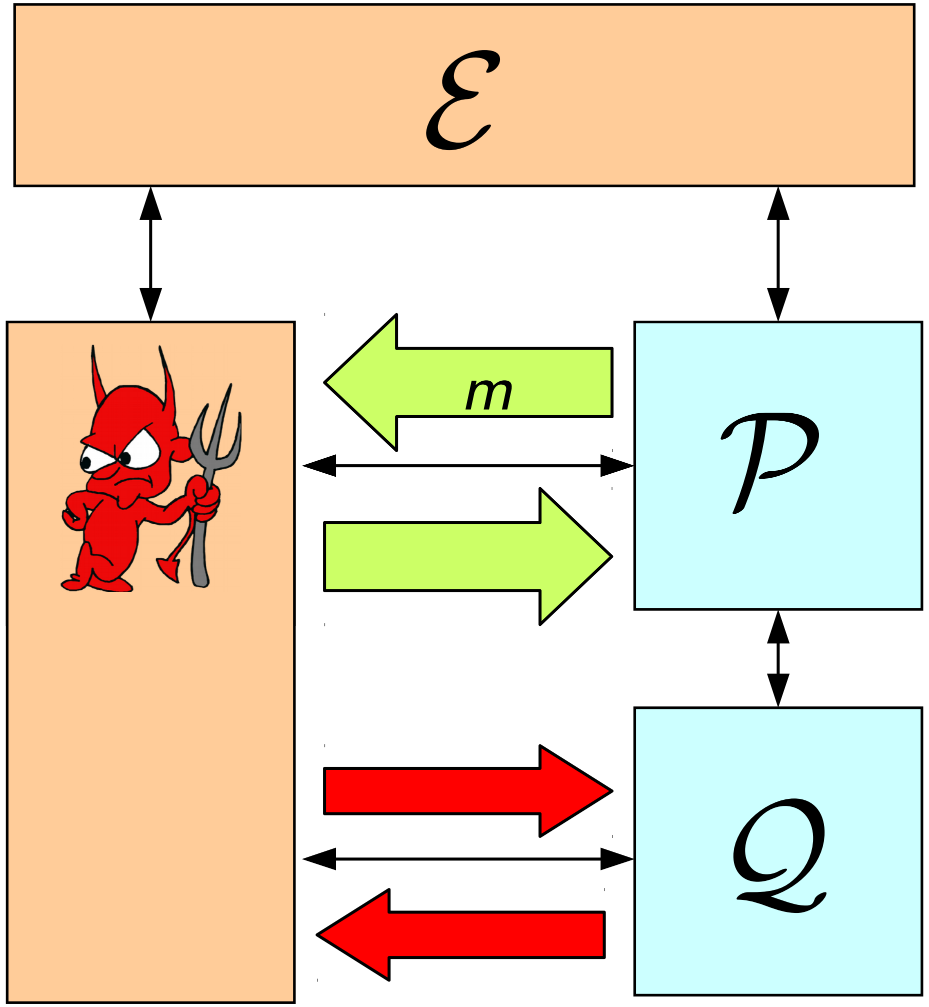

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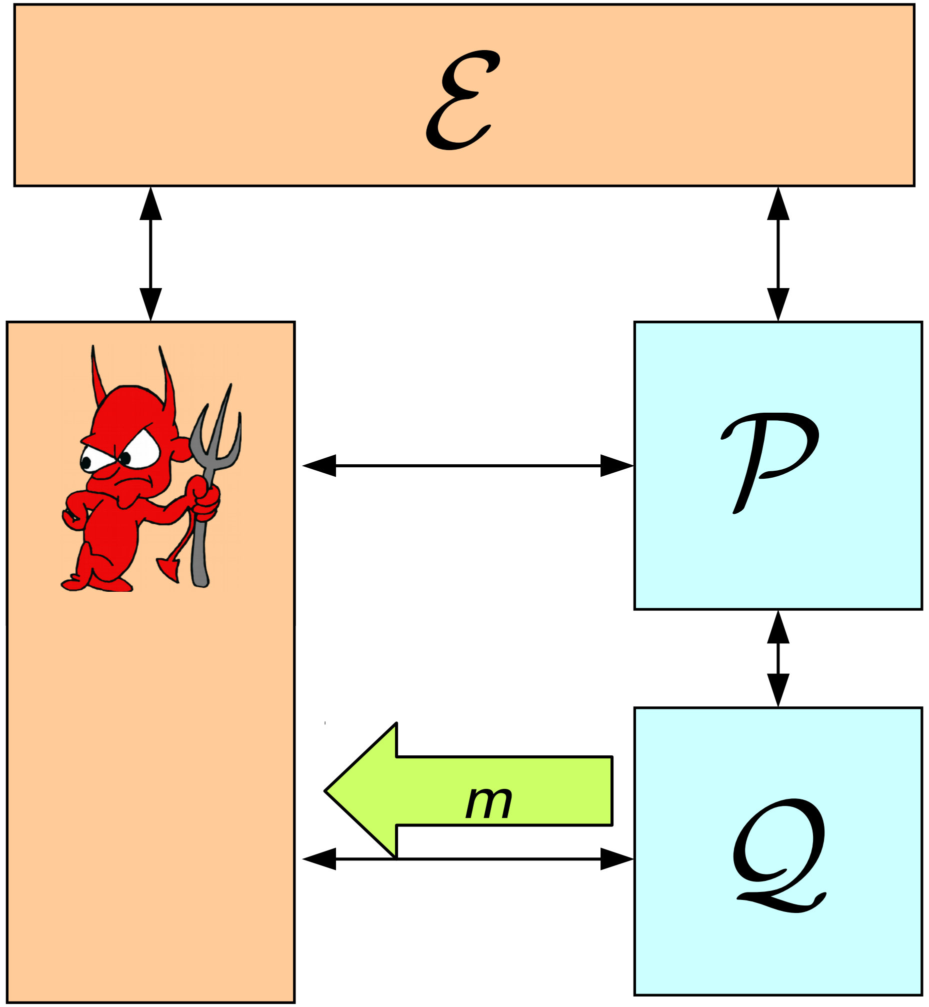

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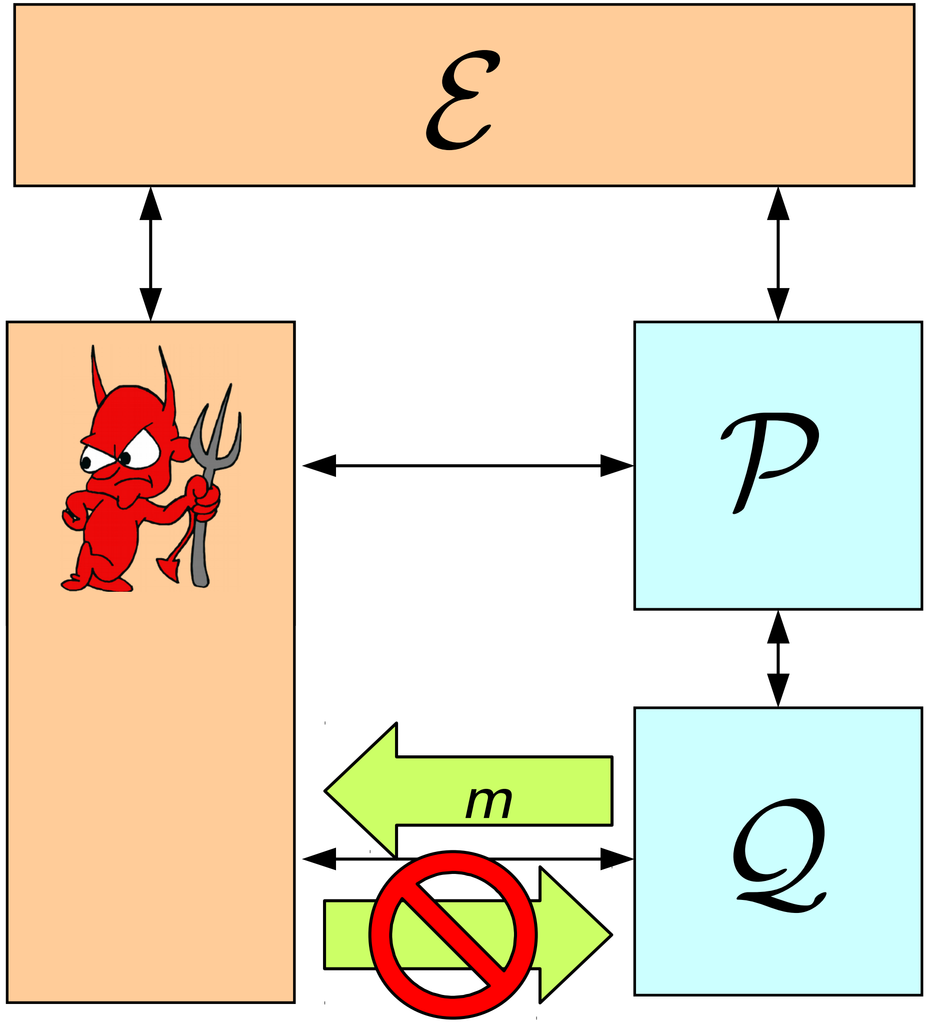

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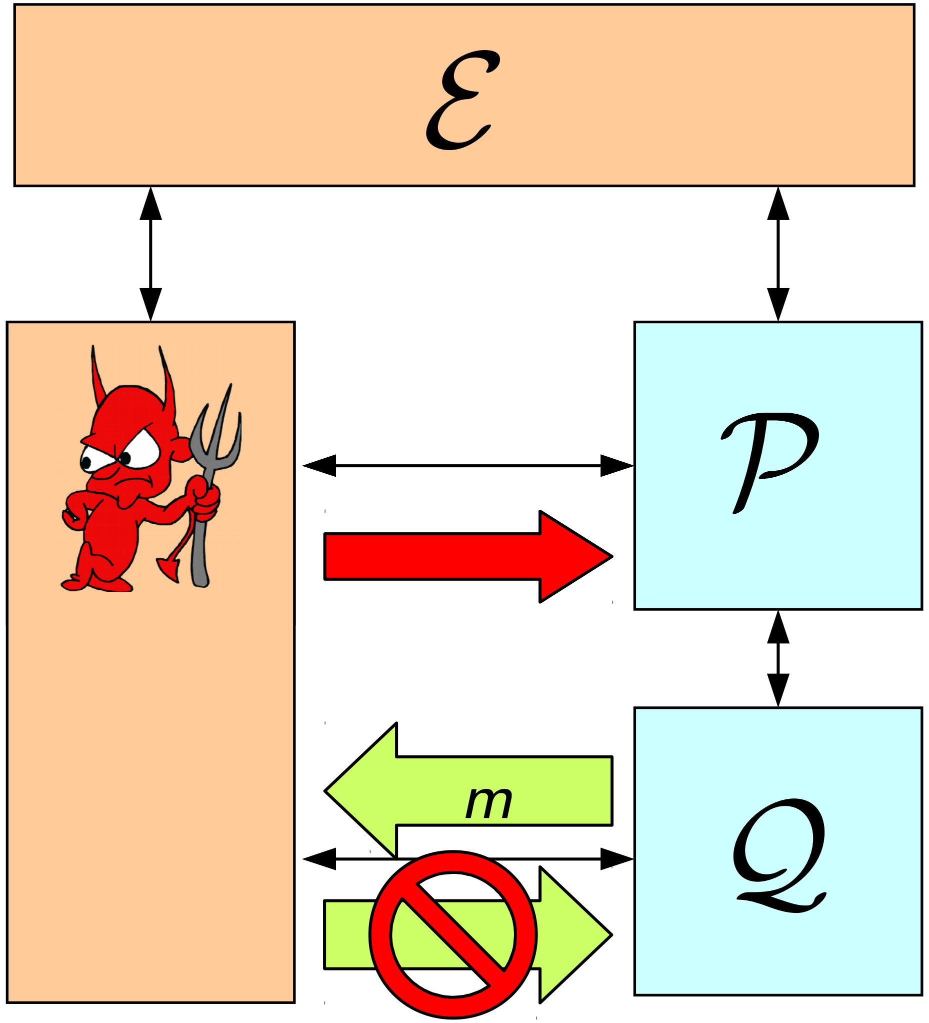

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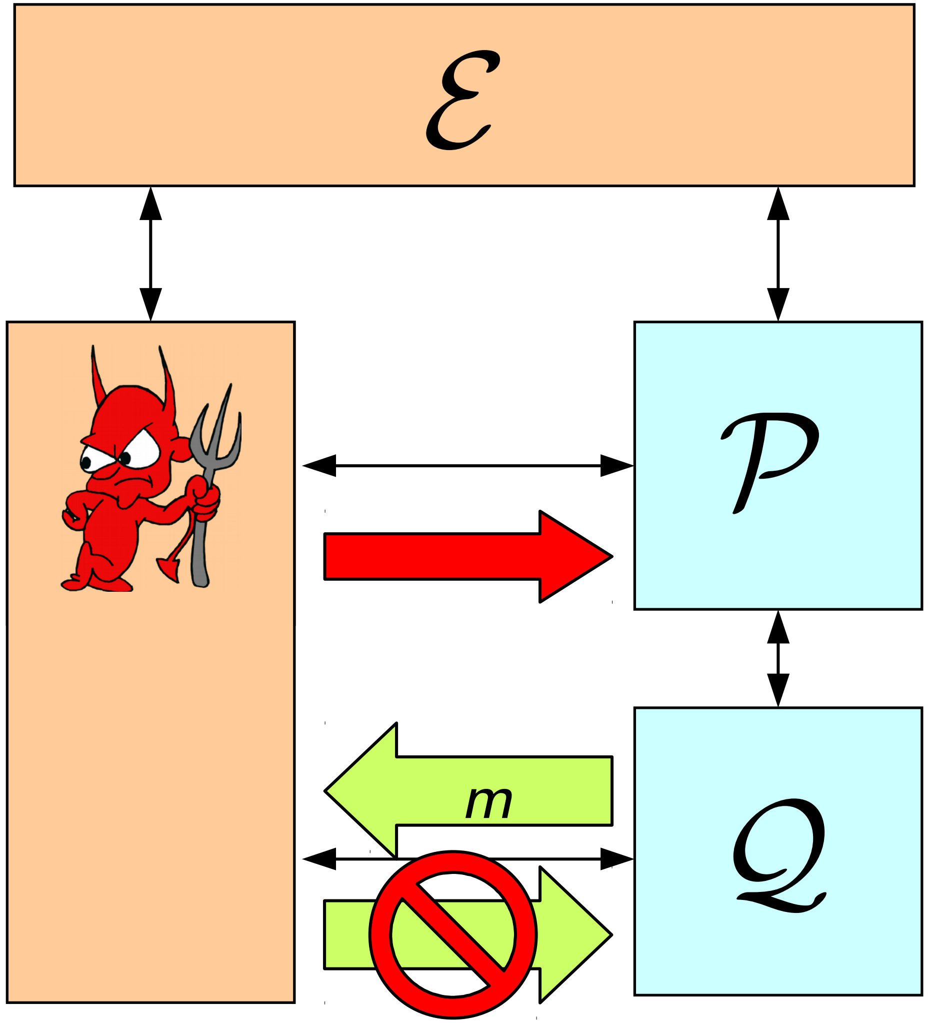
→ protocol designer has to deal with unintended behavior and artificial attacks!



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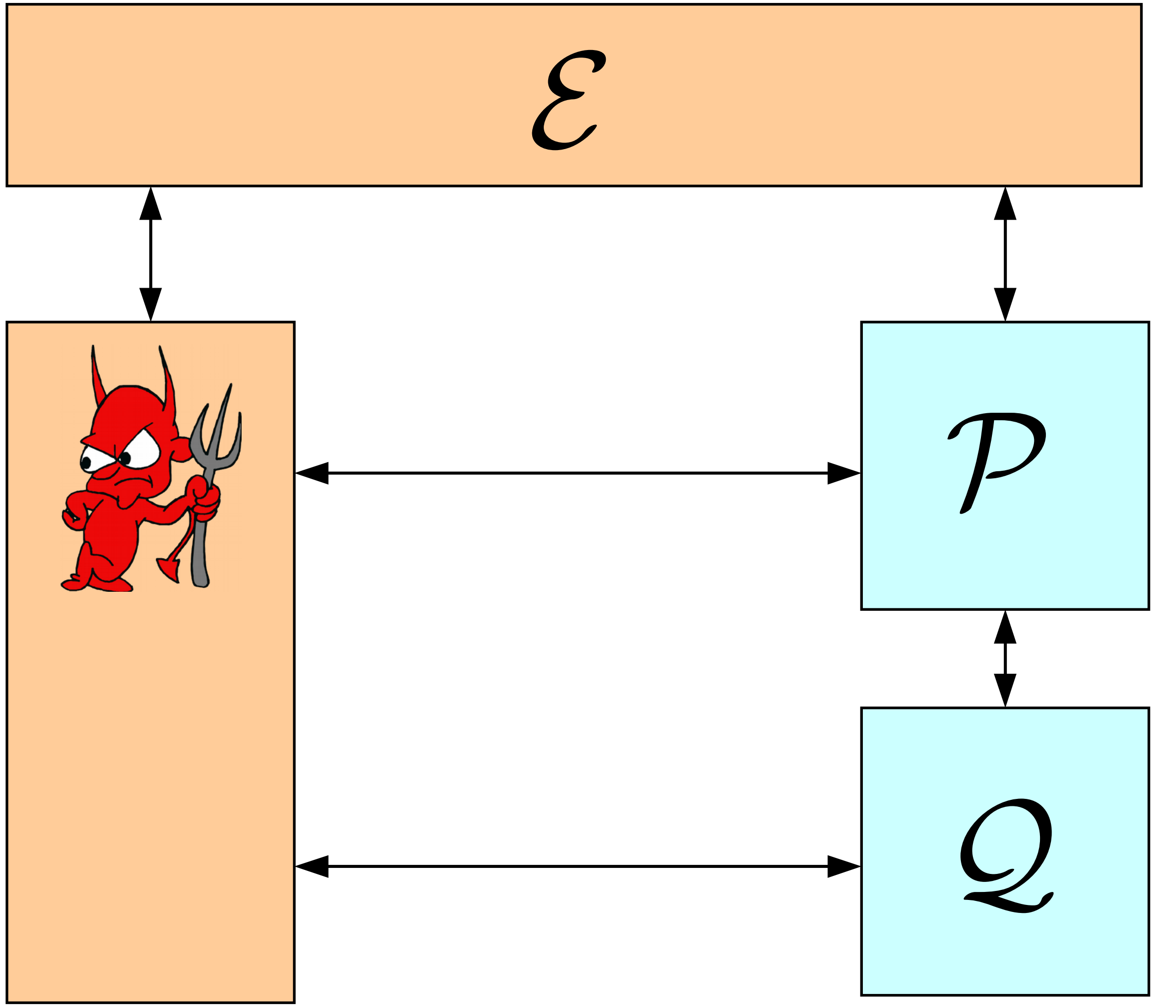

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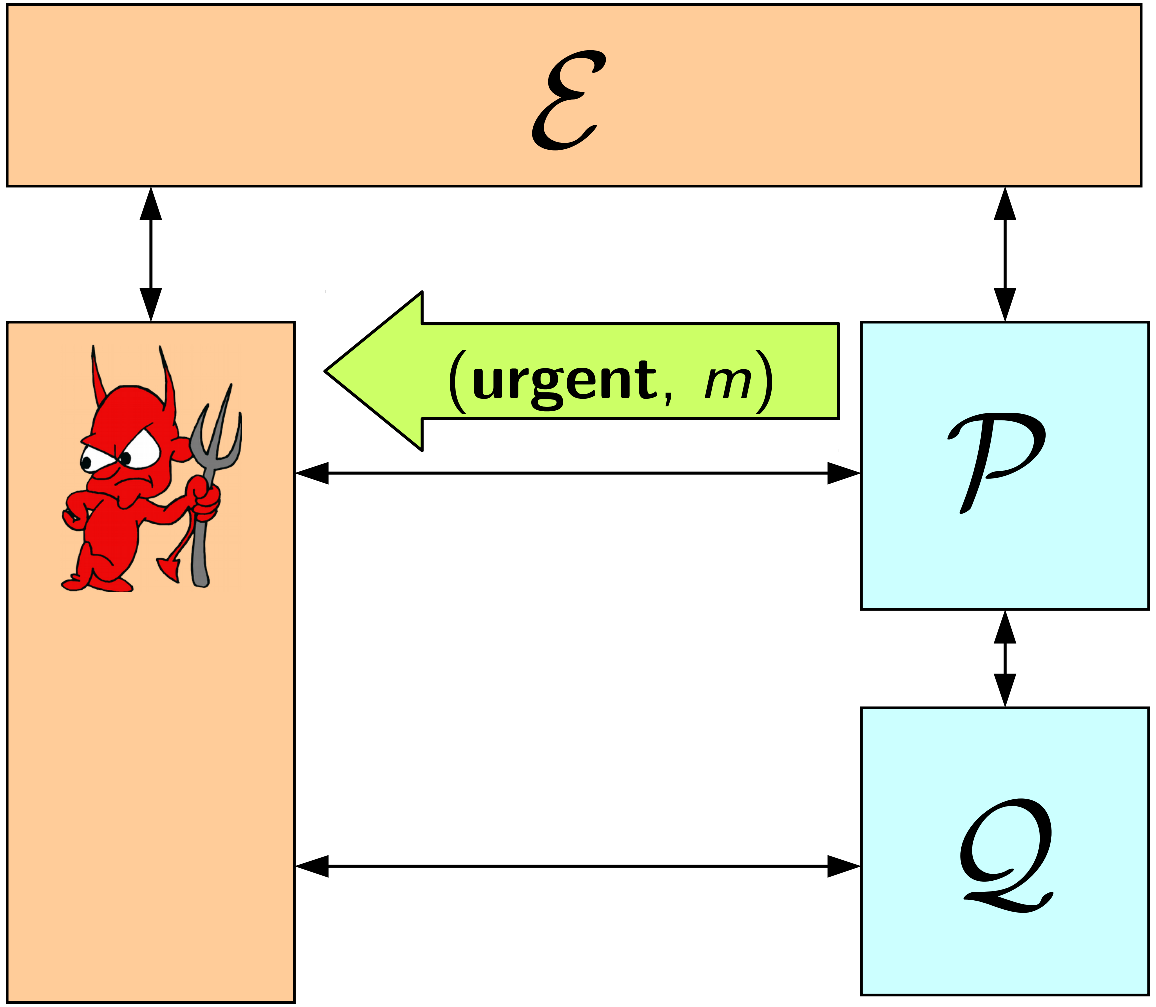

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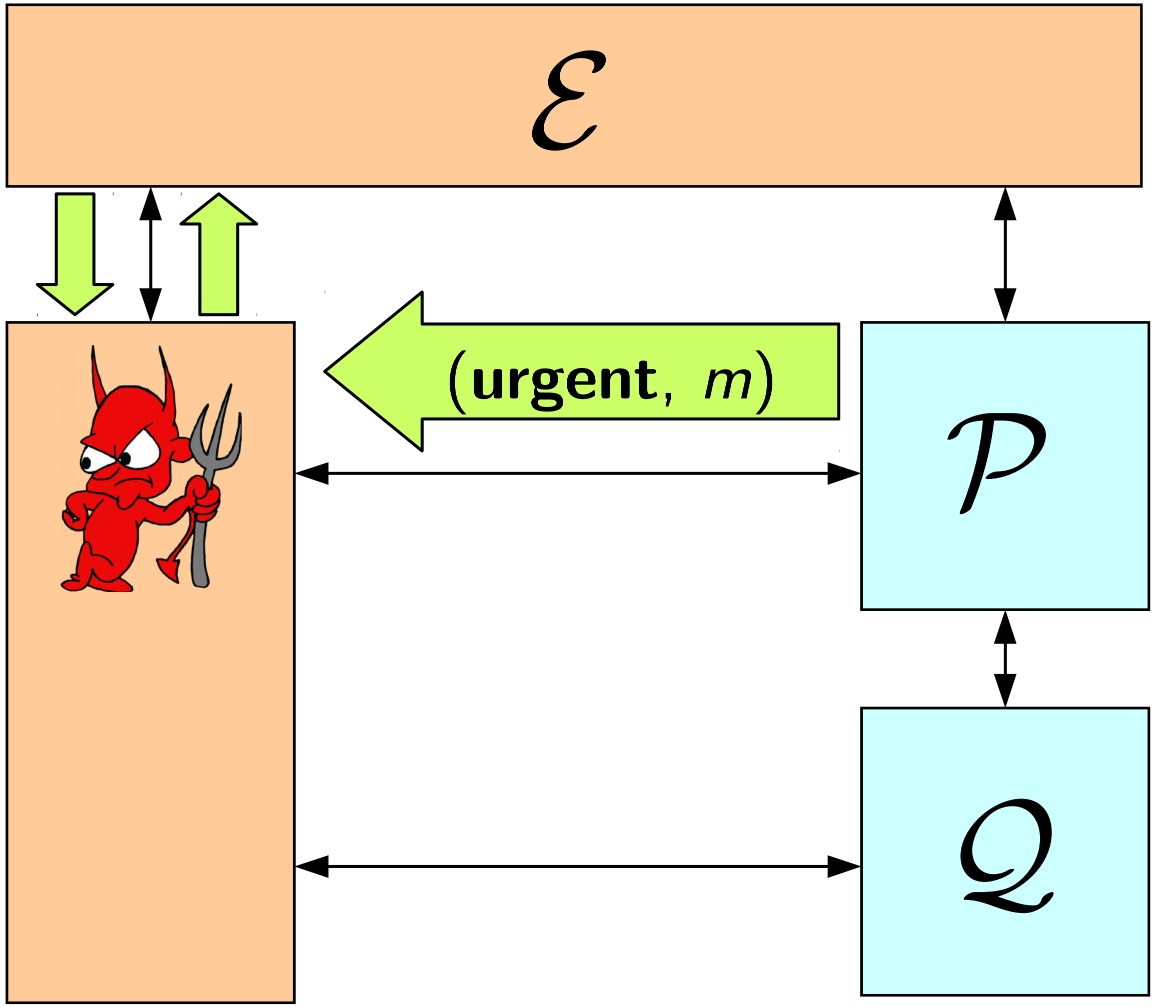

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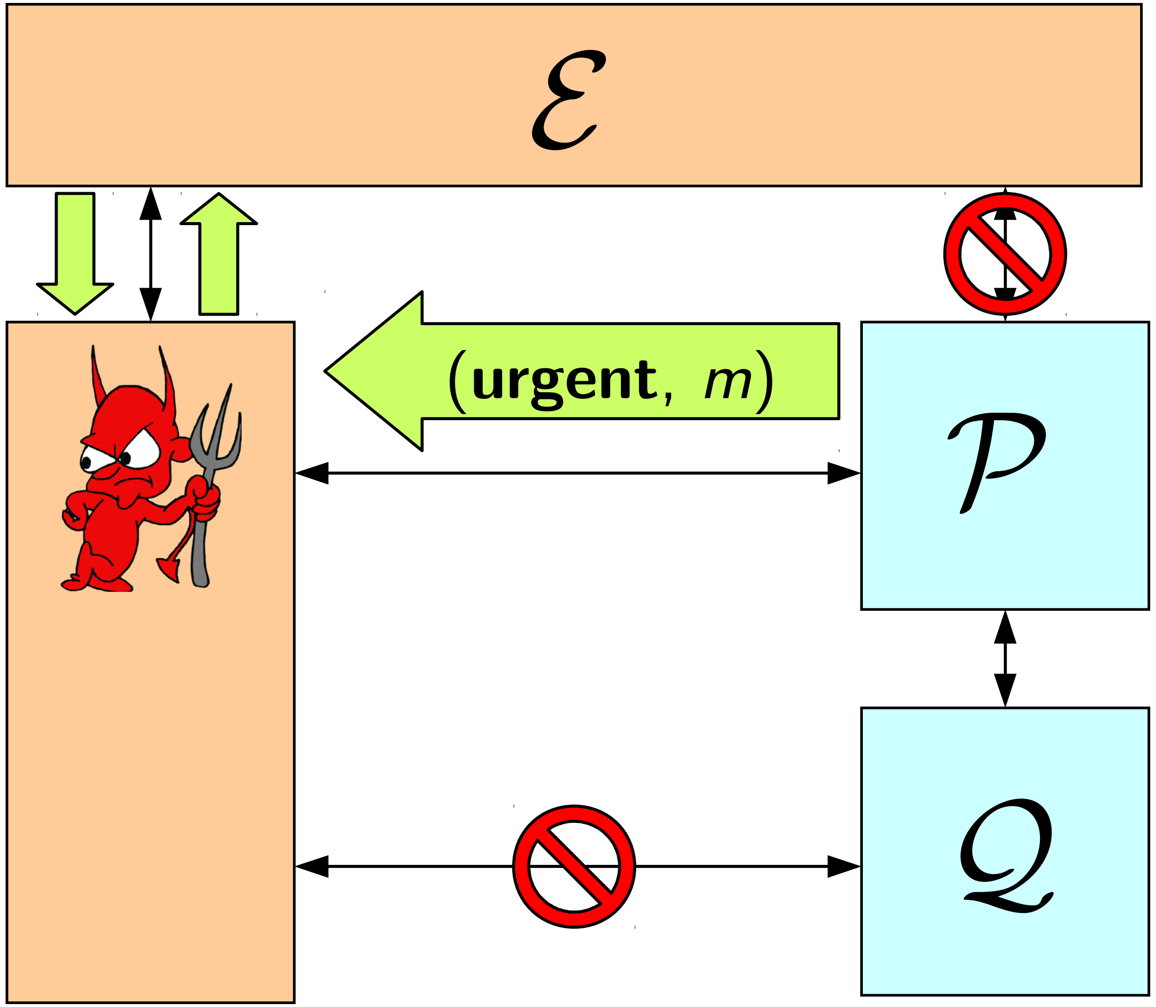

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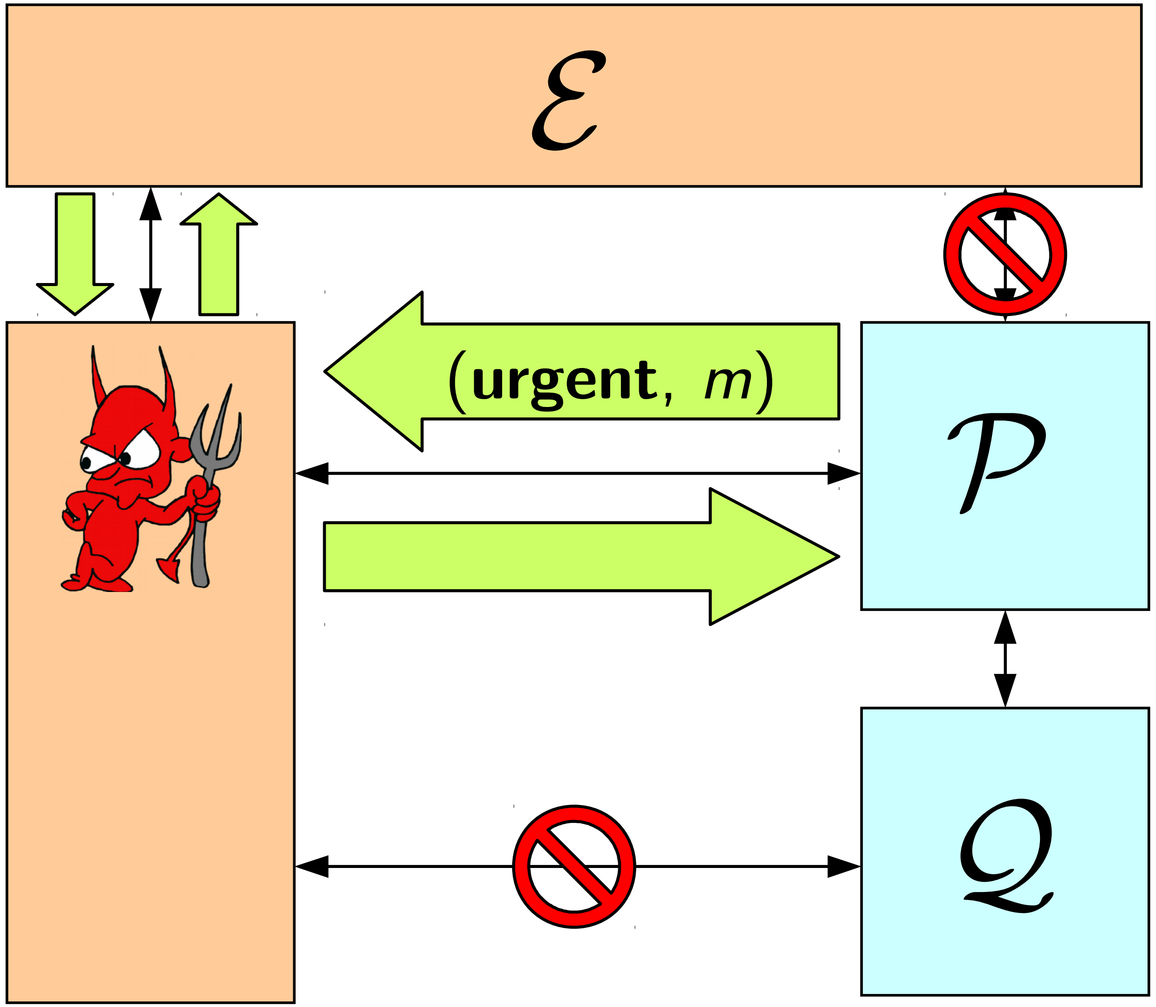

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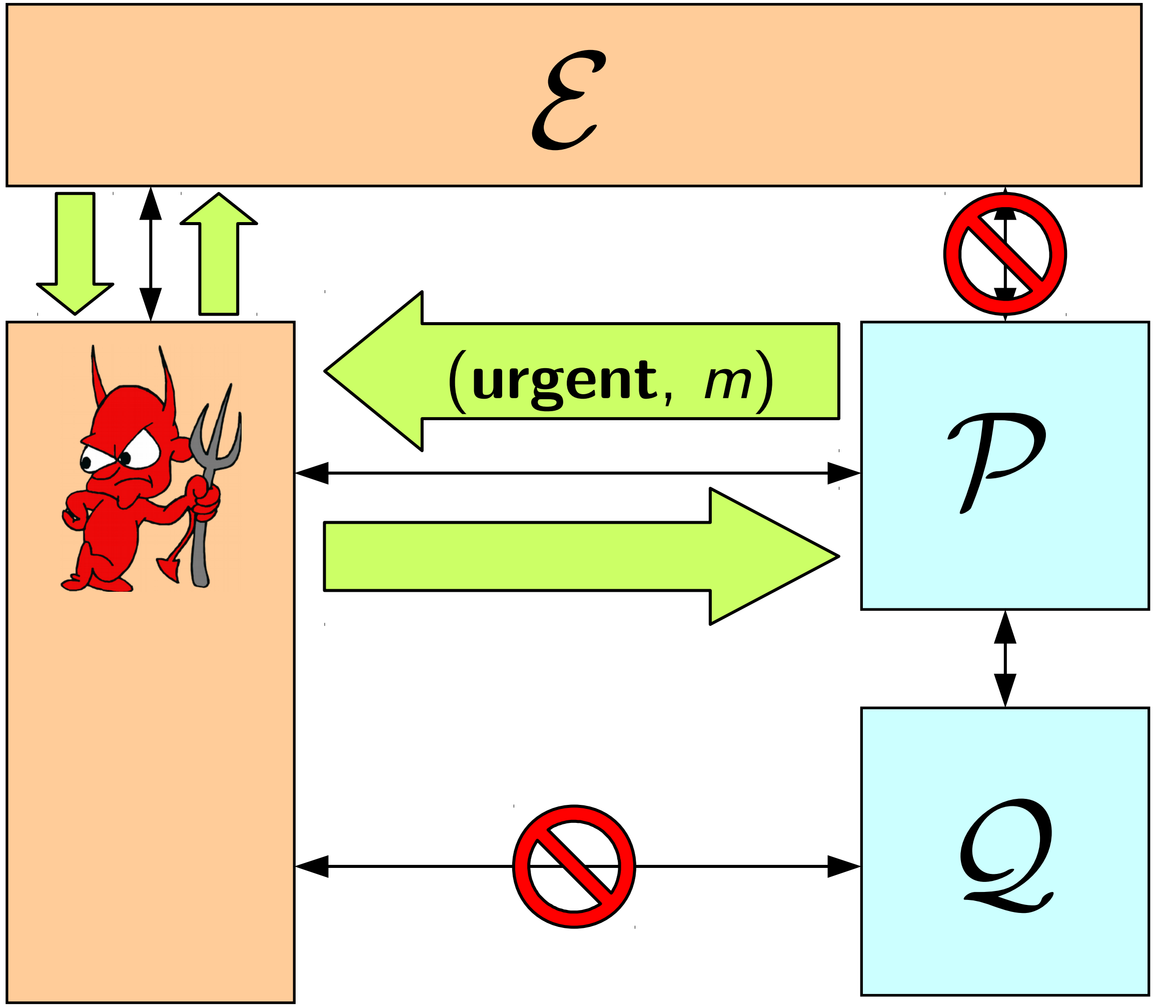

→ easy to use

→ simplifies both protocol modeling and analysis

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