



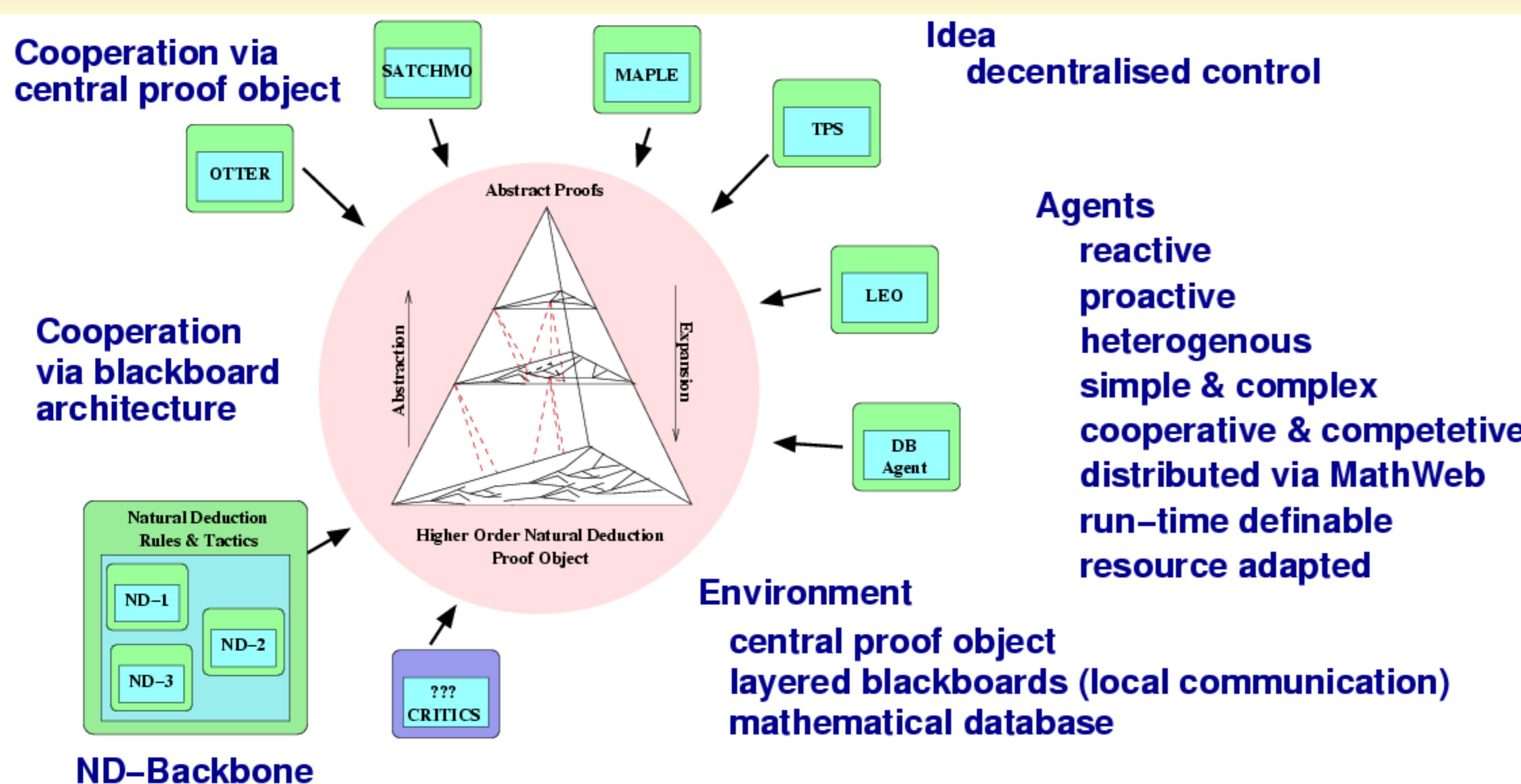
Agent Based Theorem Proving



Volker Sorge, University of Birmingham

Christoph Benzmüller, University of Saarbrücken

State of the Current Ω -ANTS System



Shortcomings

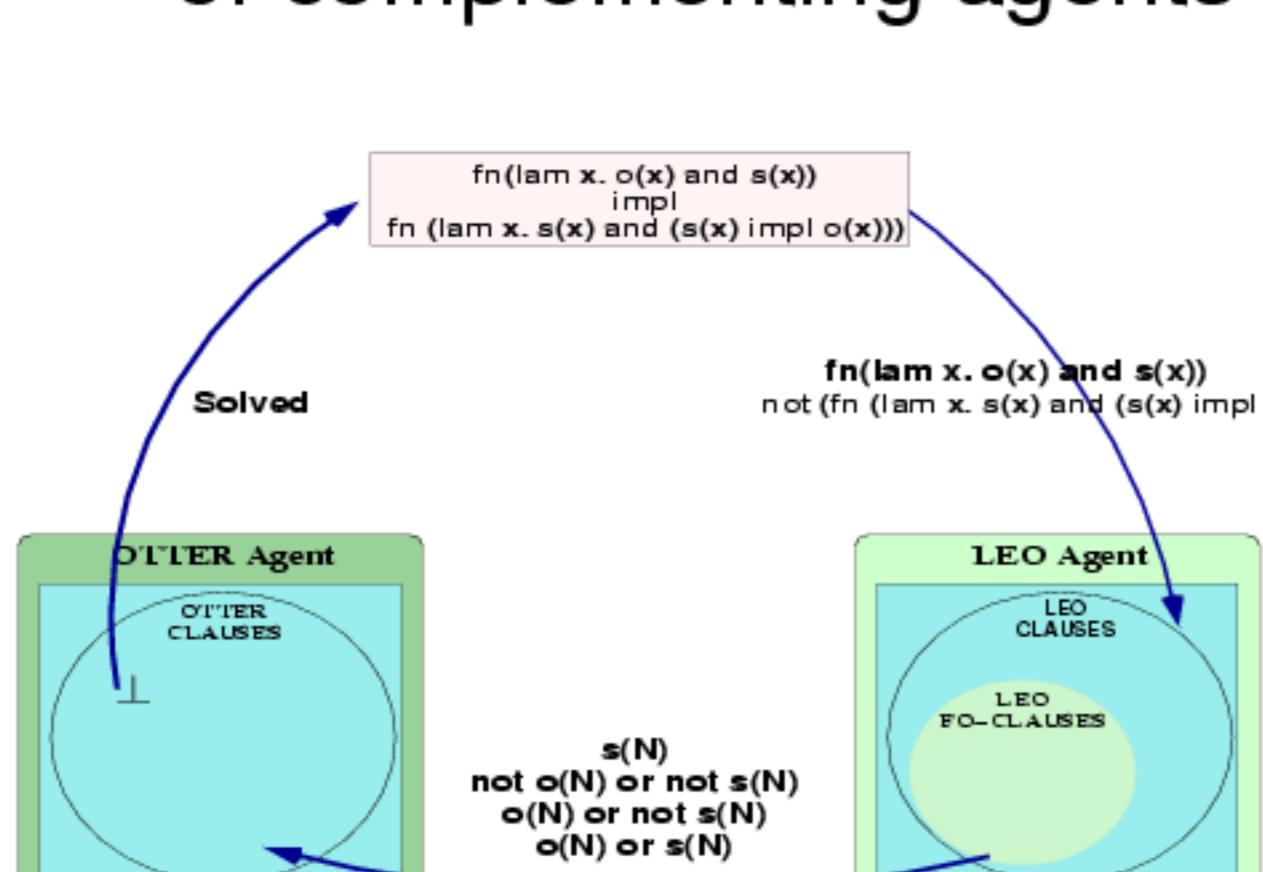
- Very centralized structure
- Not enough flexibility
- Cooperations rather accidental than conscious
- Vast communication overhead

Flexible Cooperation

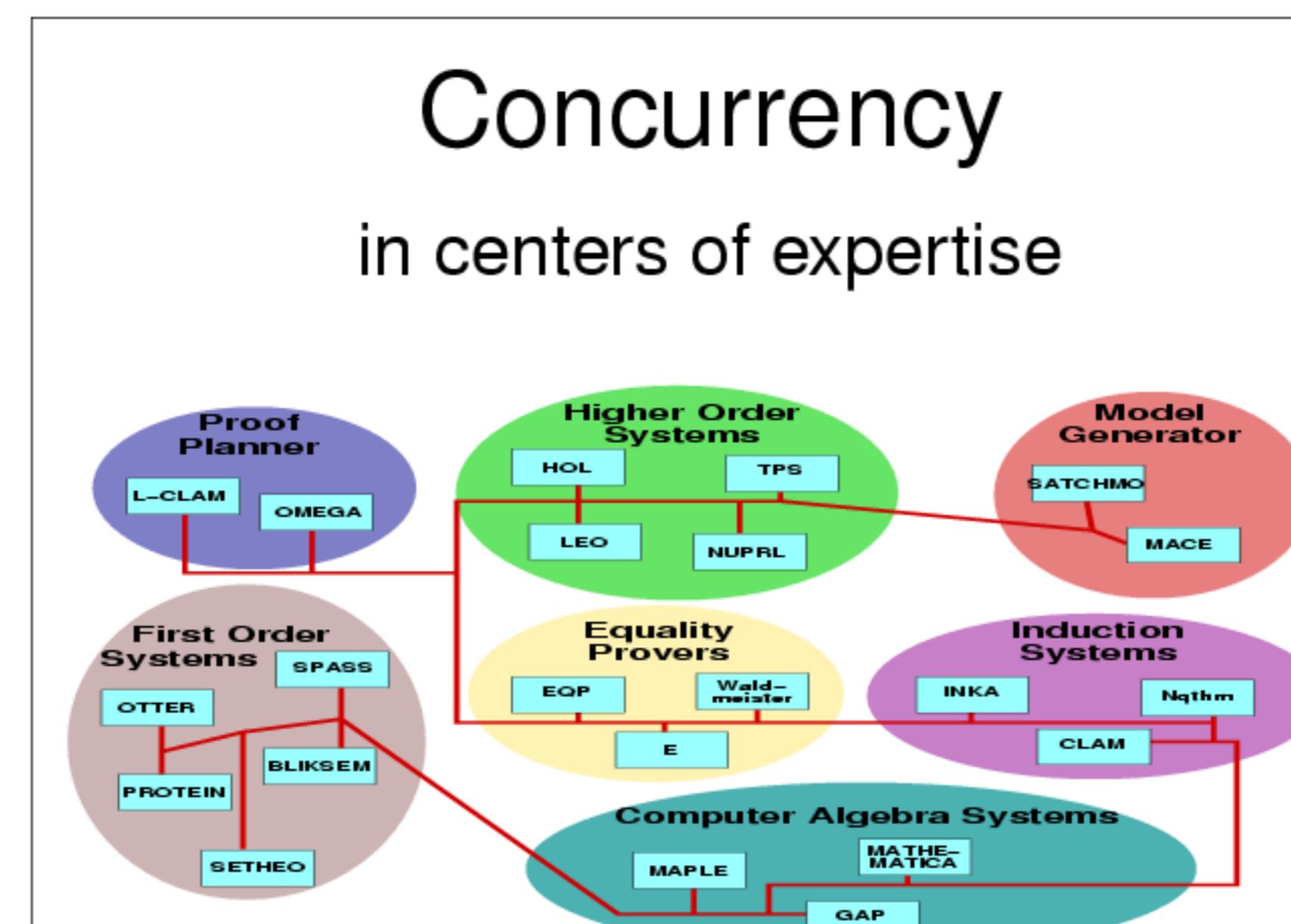
- Automatically and dynamically **form clusters of reasoning agents**
- Perform proof search in single clusters
- **Decentralize communication** of partial proofs

- agents have to be self-aware and aware of others
- clusters can use specialized protocols to communicate concisely (e.g., sets of clauses)

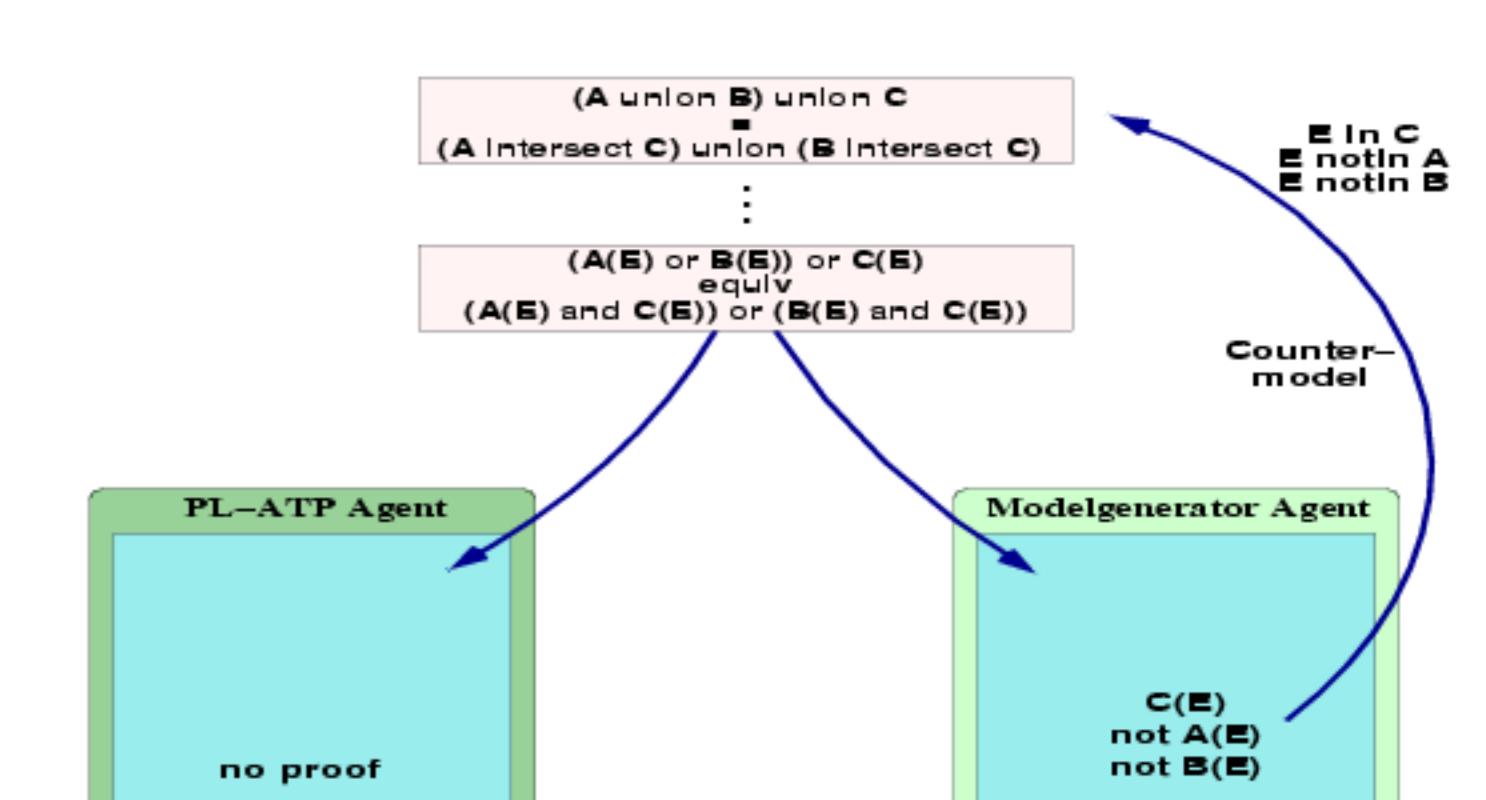
Cooperation of complementing agents



Concurrency in centers of expertise



Exploration with contrasting abilities



Distributed Proof Search

And-Or-Parallelism to tackle

- one subproblem by several components
- several subproblems in parallel

Challenging problems:

1. dependencies between parallel subproofs (handling interferences, exchange of informations, ...)
2. spawning and resynchronizing proof threads
3. backtracking (criteria, organization, ...)
4. reconstruction of proof object (guarantee correctness, necessary information?, ...)

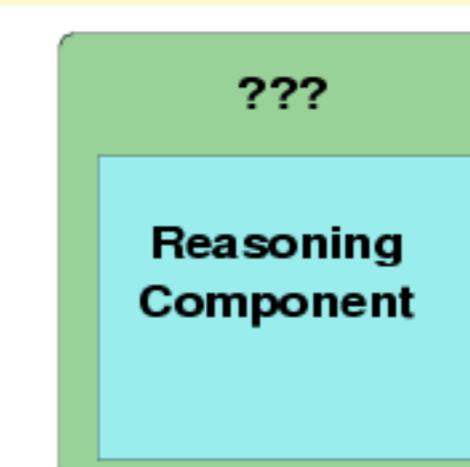
Identify and manage resources for the system

- computation time and memory
- **logical dependencies between subproofs** for example: variable instantiations, ...
- **size of partial proofs to be exchanged**

Enable negotiation for resources

Resources

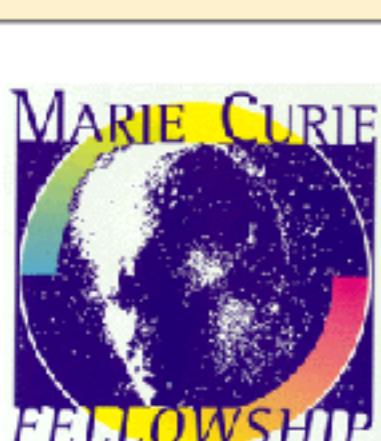
Architecture for Reasoning Agents



Embedding agent-shell has to be capable of:

- Self-recognition of own strengths/weaknesses
- Learning from past experiences
 - failure/success in a domain
 - which other agents to cooperate with
- Negotiate with other agents
 - to cooperate/form clusters
 - about resources, communication language, ...

Examine the SimAgent toolkit if it can be employed



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