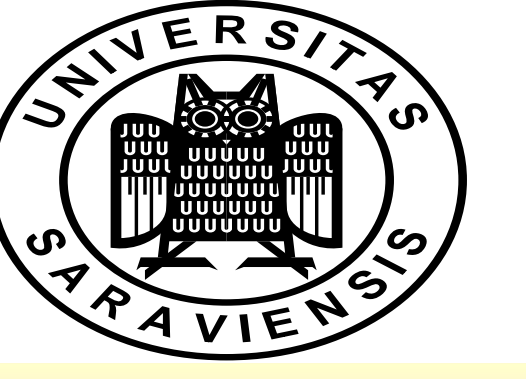




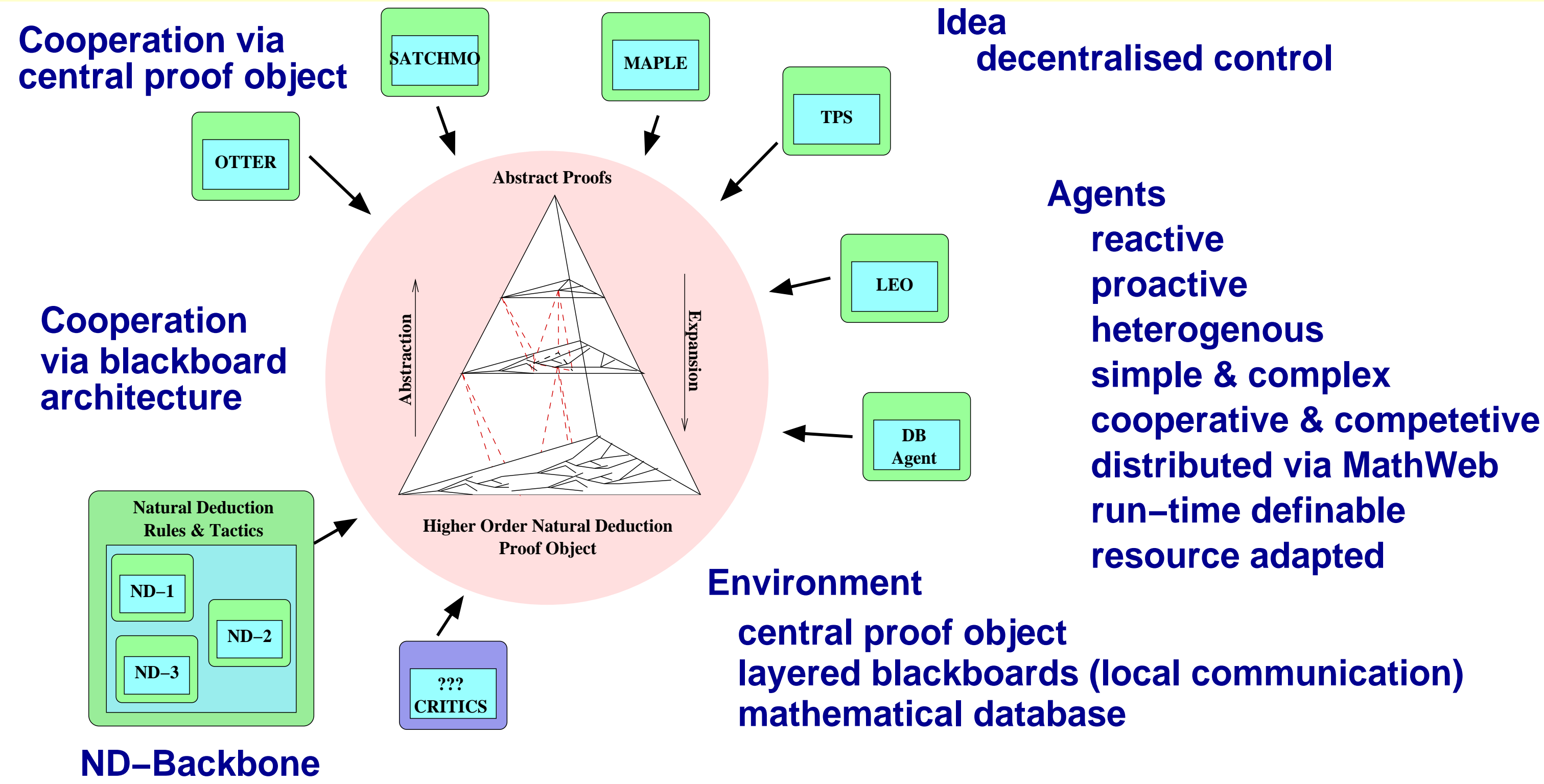
Agent Based Theorem Proving



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State of the Current Ω -ANTS System



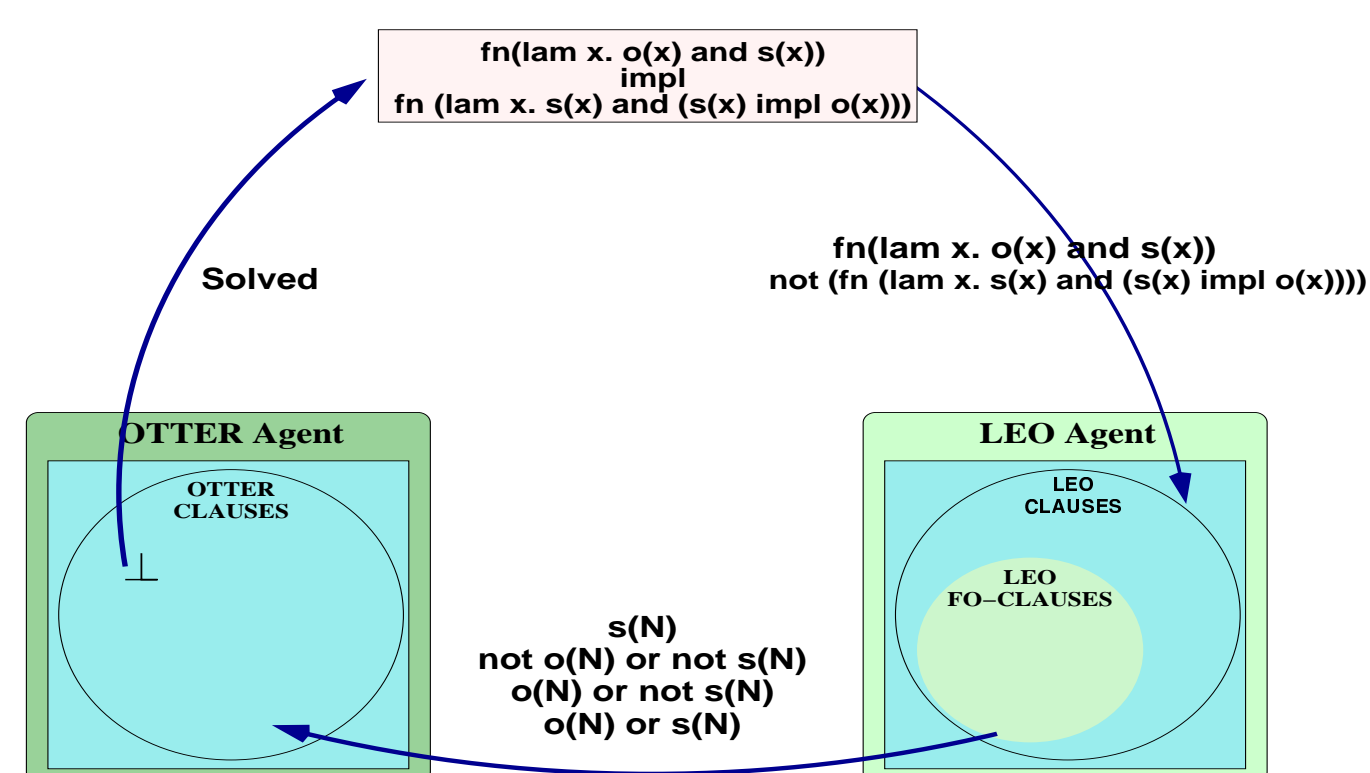
Shortcomings

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

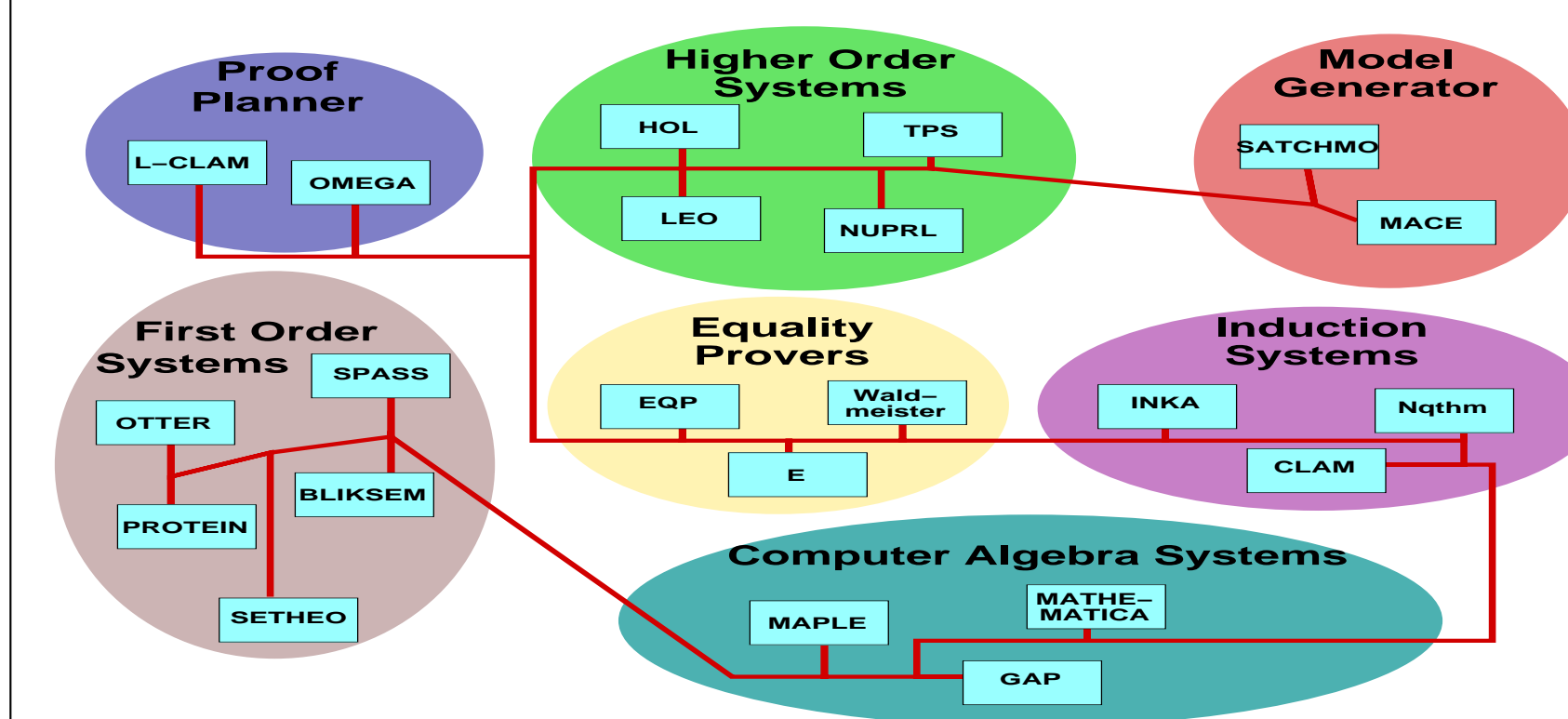
Flexible Cooperation

- 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)

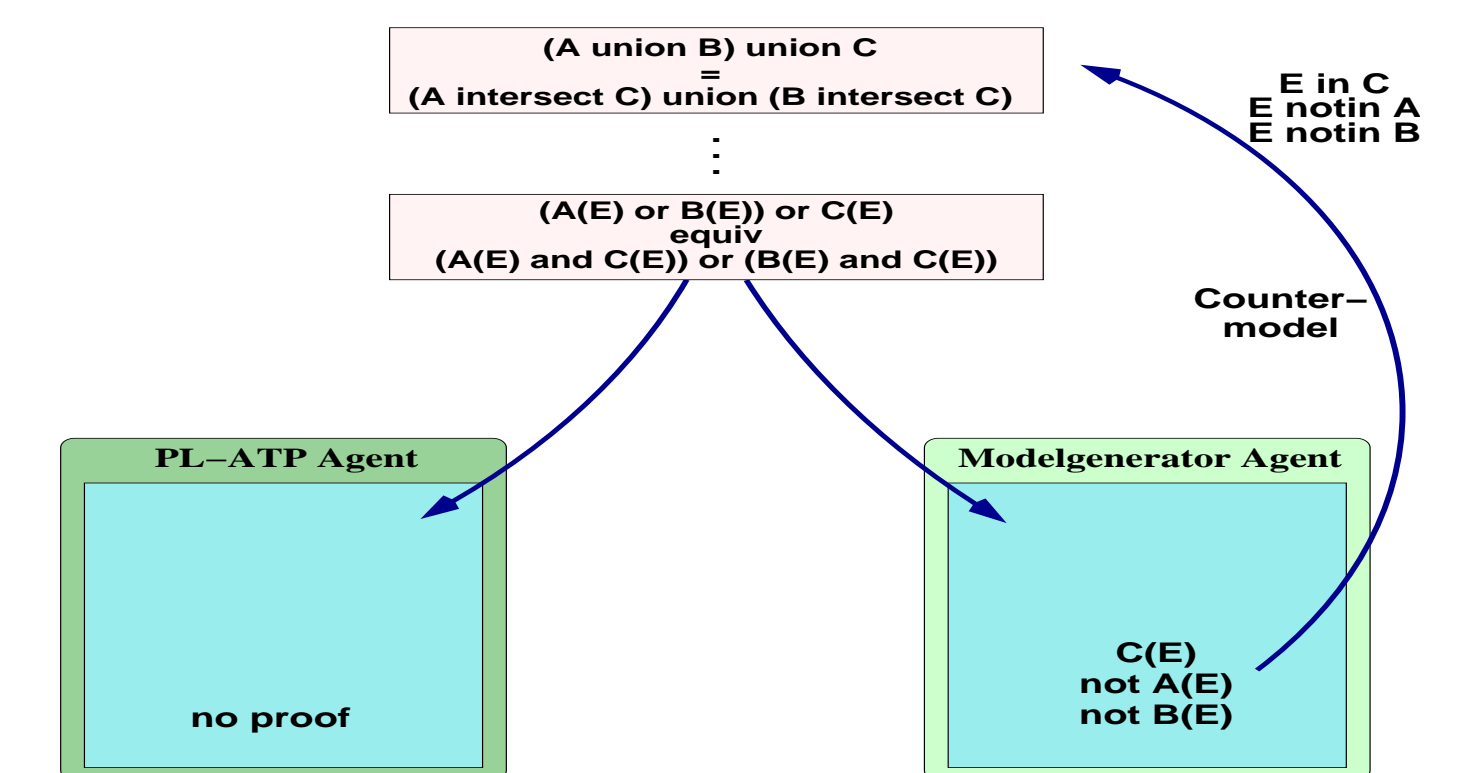
Cooperation of complementing agents



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?, ...)

Resources

Identify and manage resources for the system

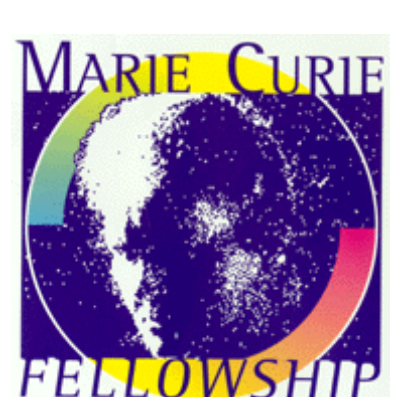
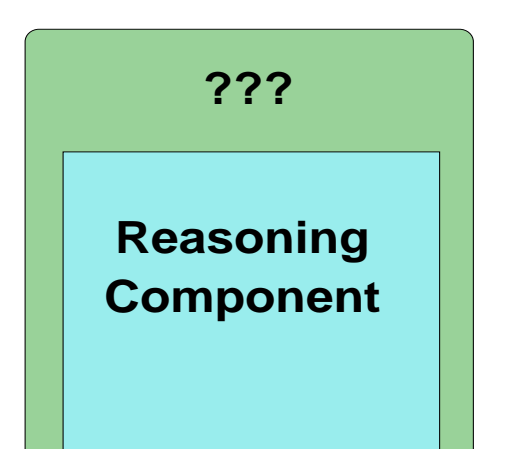
- computation time and memory
- **logical dependencies between subproofs** for example: variable instantiations, ...
- **size of partial proofs to be exchanged**

Enable negotiation for resources

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, ...



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