

Scalable decentralized supply chain formation through binarized belief propagation

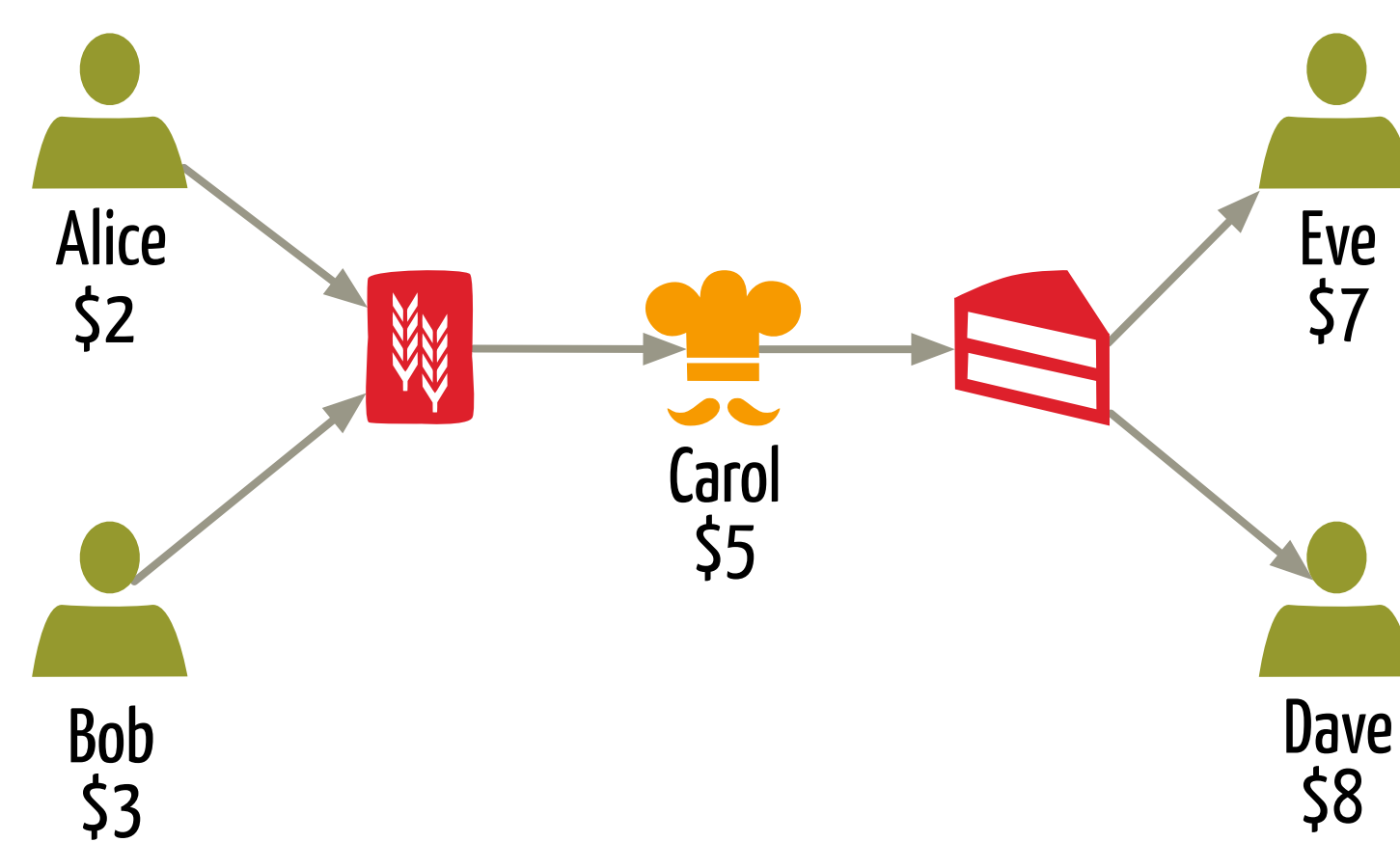
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GOAL

To provide a scalable method for Supply Chain Formation in markets with high degrees of competition and without third party mediators.



CONTRIBUTIONS

Reduced memory requirements
Reduced communication requirements
Solutions of higher quality than state of the art
Max-sum based method over binary factor graph

RB-LBP: The supply chain formation problem encoded as a binary factor graph

Max-sum

Operates over a binary factor graph to find approximate solutions to the Supply Chain Formation problem.

Binary Variables

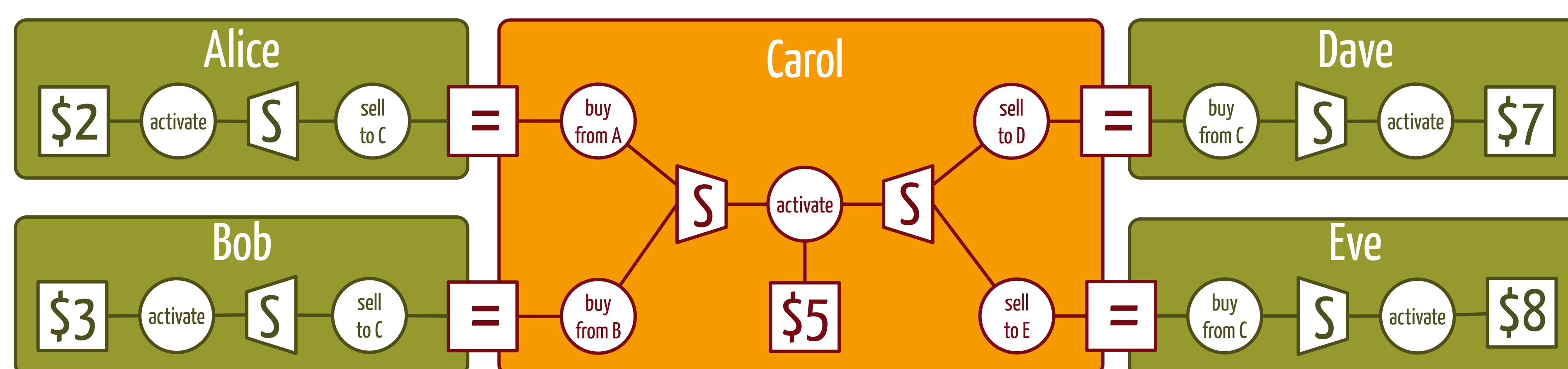
Each agent breaks down her decision into boolean choices. Boolean choices decouple agents' decisions.

Factors as logical constraints

No need to store factors in memory. This allows to simplify the expressions to compute messages.

Single-valued messages

Each agent sends a single-valued message to each of her neighbours containing her willingness to collaborate with them.



Activation Variable encodes an agent's decision to be active (the agent willingness to be part of the supply chain).

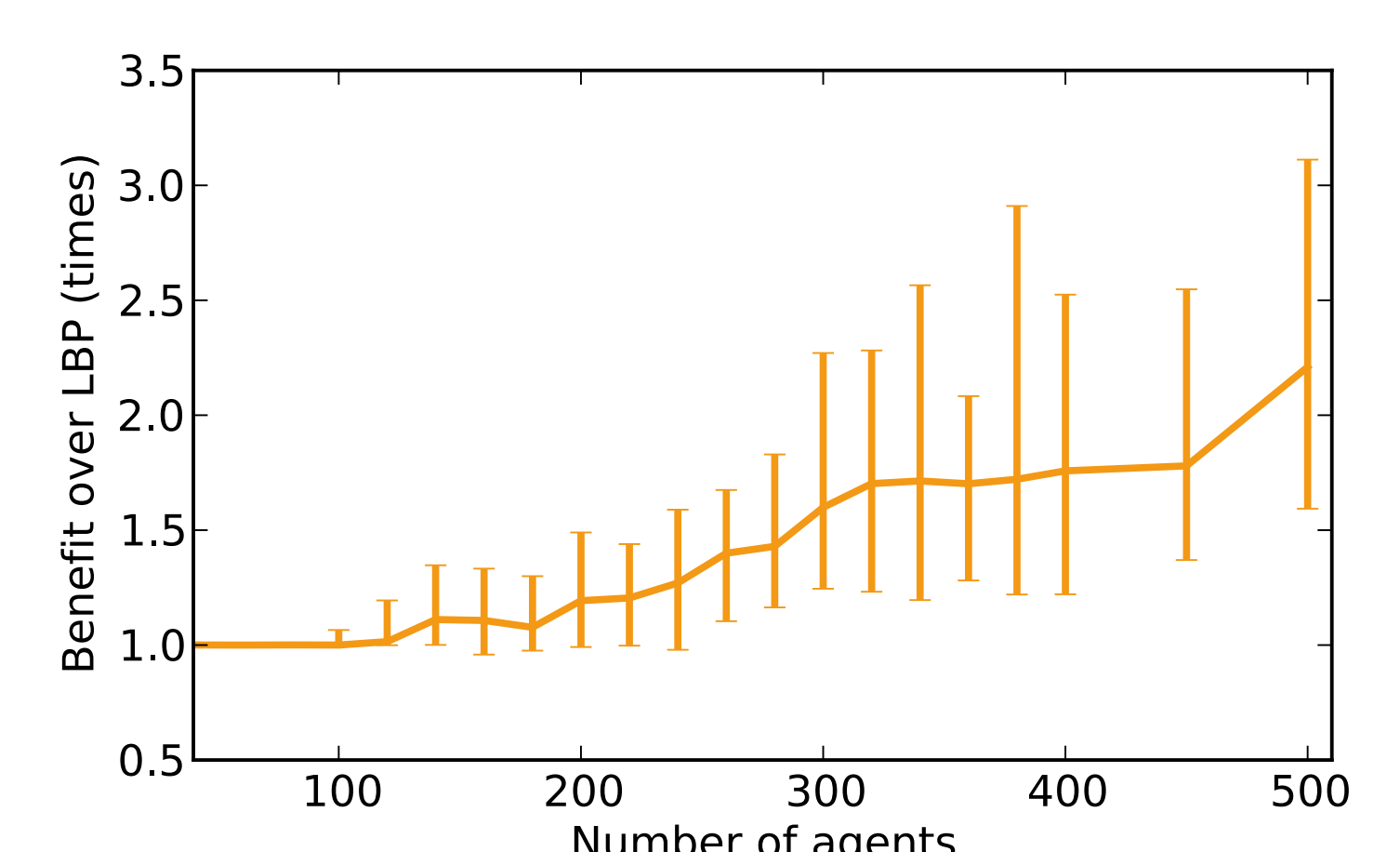
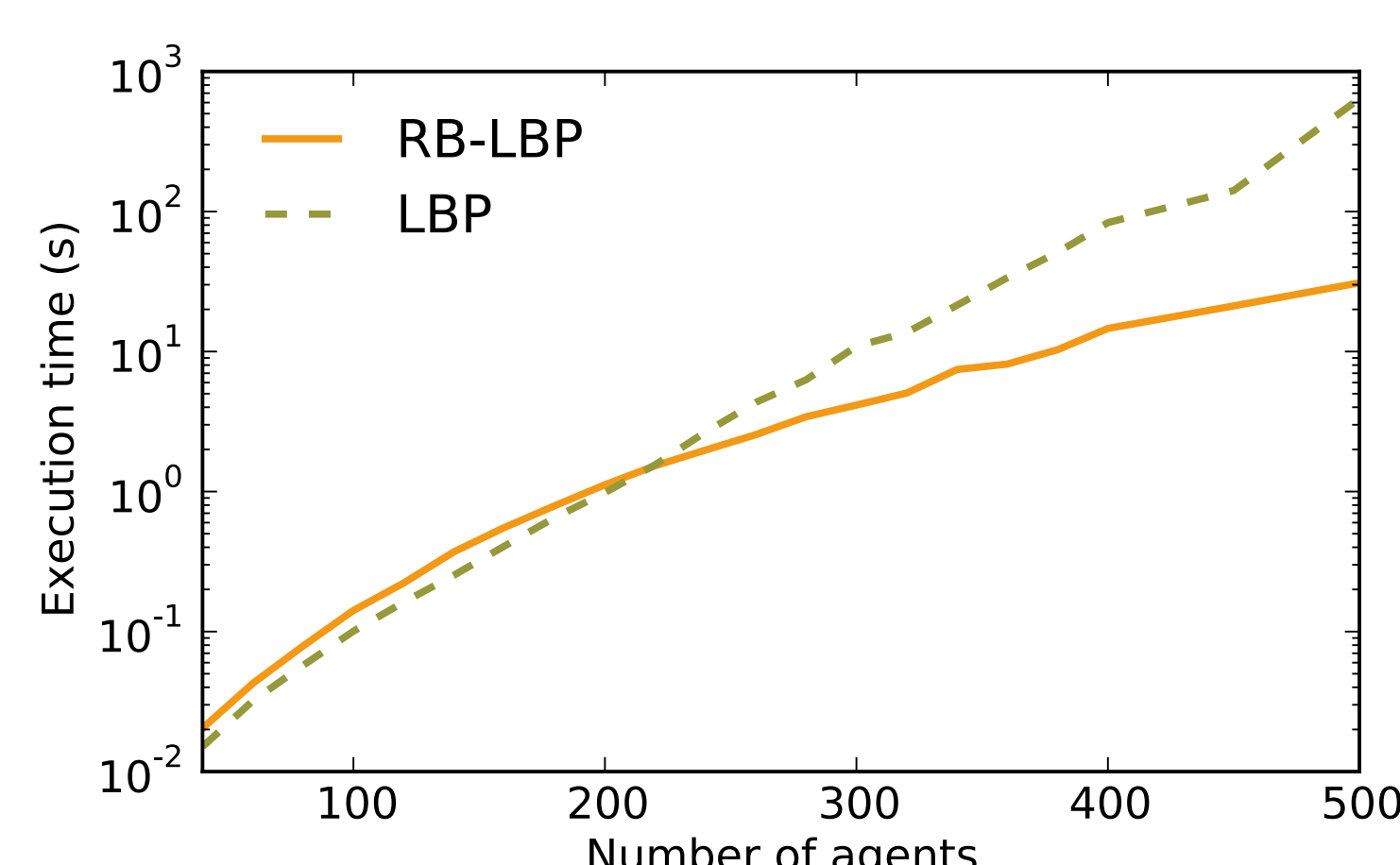
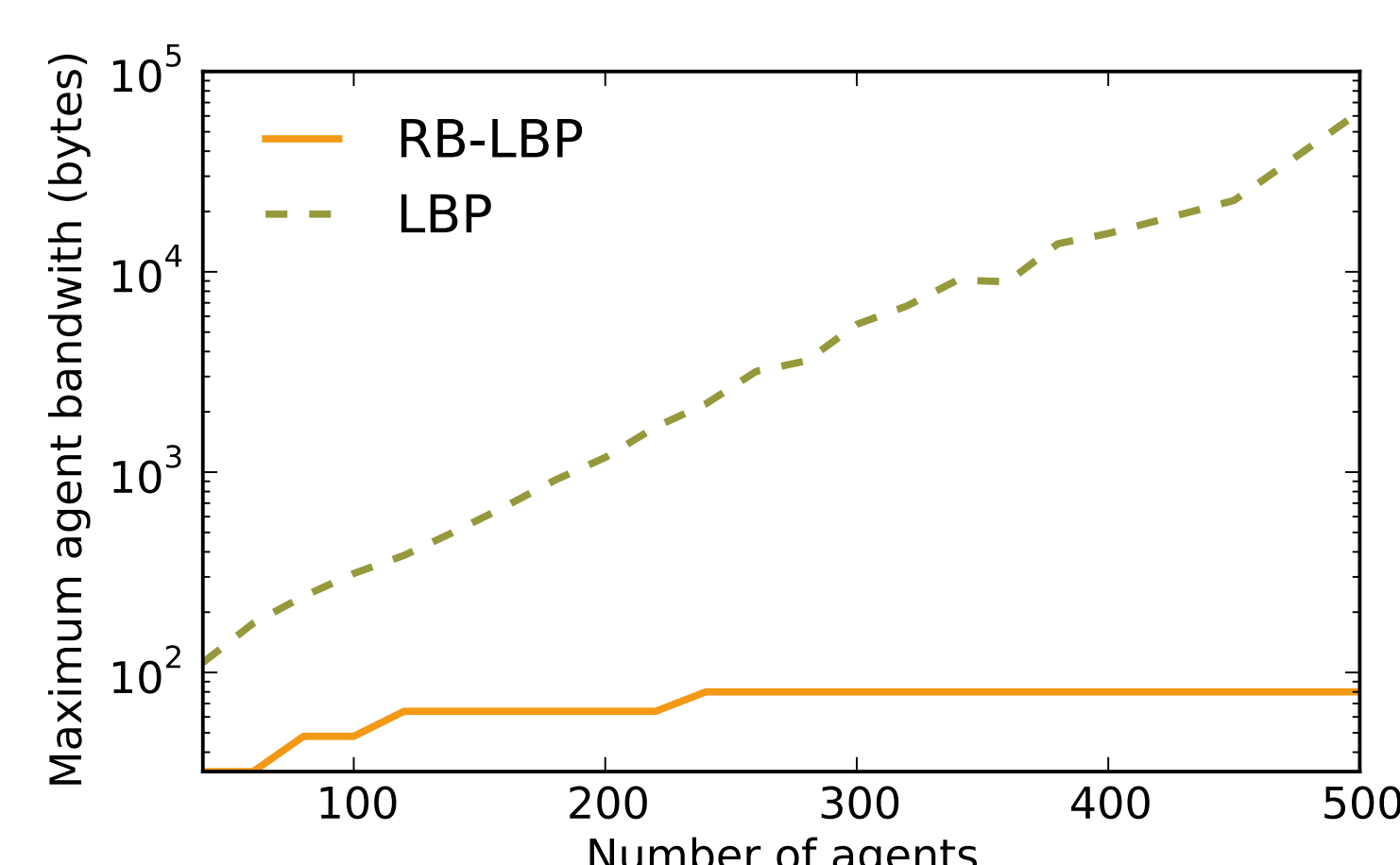
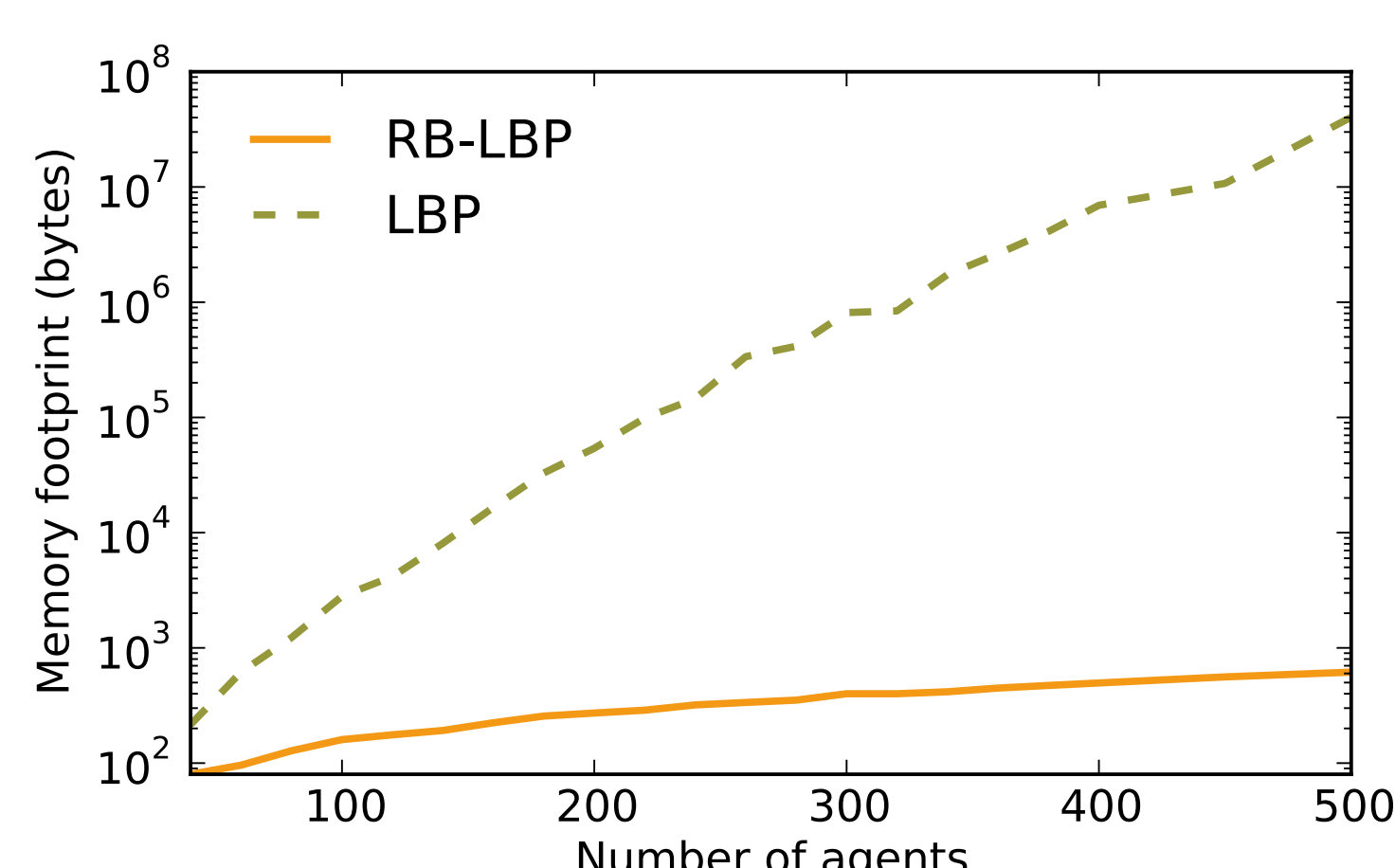
Option Variable encodes an agent's decision to trade each of her goods with each of her potential partners.

Activation Factor encodes an agent's activation cost.

Selection Factor guarantees that an agent trades each of her goods with at most another agent.

Equality Factor guarantees that an agent takes coherent decisions with her neighbors.

Experimental Evaluation



up to 10⁵ times less memory

up to 787 times less bandwidth

up to 20 times faster

up to twice better solutions

LBP is the state of the art decentralized method for Supply Chain Formation described in [M. Winsper and M. Chli. Decentralised supply chain formation: A belief propagation-based approach. In In Proceedings of the 19th European Conference on Artificial Intelligence (ECAI), 2010.]

