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Alaa Daoud, Flavien Balbo, Paolo Gianessi, Gauthier Picard. A Generic Multi-Agent Model for Resource Allocation Strategies in Online On-Demand Transport with Autonomous Vehicles. 20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2021), May 2021, London (virtual), United Kingdom. emse-03186991

HAL Id: emse-03186991

<https://hal-emse.ccsd.cnrs.fr/emse-03186991>

Submitted on 31 Mar 2021

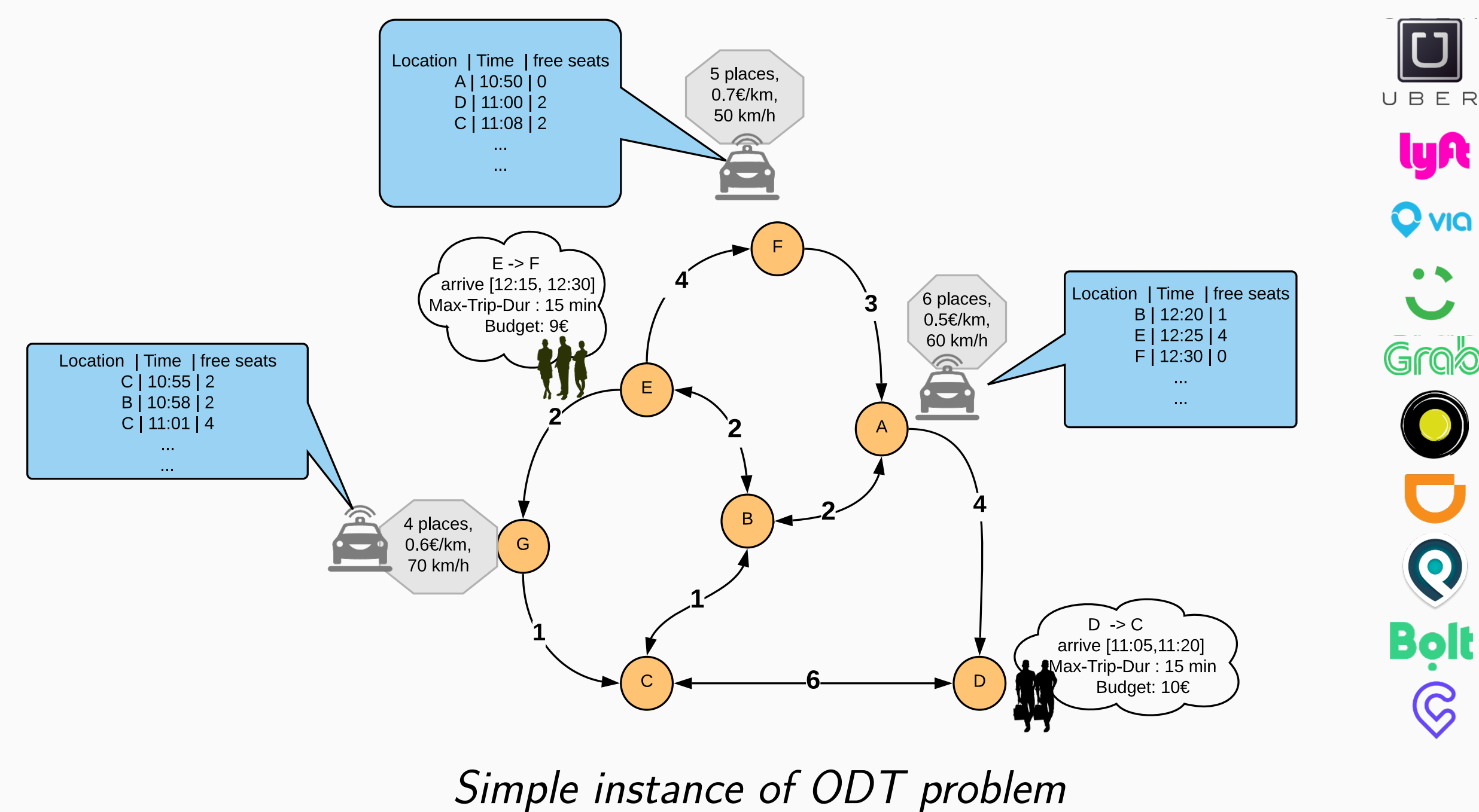
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A GENERIC MULTI-AGENT MODEL FOR RESOURCE ALLOCATION STRATEGIES IN ONLINE ON-DEMAND TRANSPORT WITH AUTONOMOUS VEHICLES

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Application domain: On-demand transport (ODT)



AV-OLRA model

Autonomous Vehicles Online Localized Resource Allocation

A generic model to ODT's dynamic resource allocation problem in autonomous vehicle fleets with communication constraints

$$\langle \mathcal{R}, \mathcal{V}, \mathcal{G}, \mathcal{T} \rangle$$

- \mathcal{R} : a dynamic set of requests
- \mathcal{V} : a fleet of m vehicles
- \mathcal{G} : a graph defining the road network
- \mathcal{T} : the problem's time horizon

Solution methods

Depends on the adopted coordination mechanism (CM)

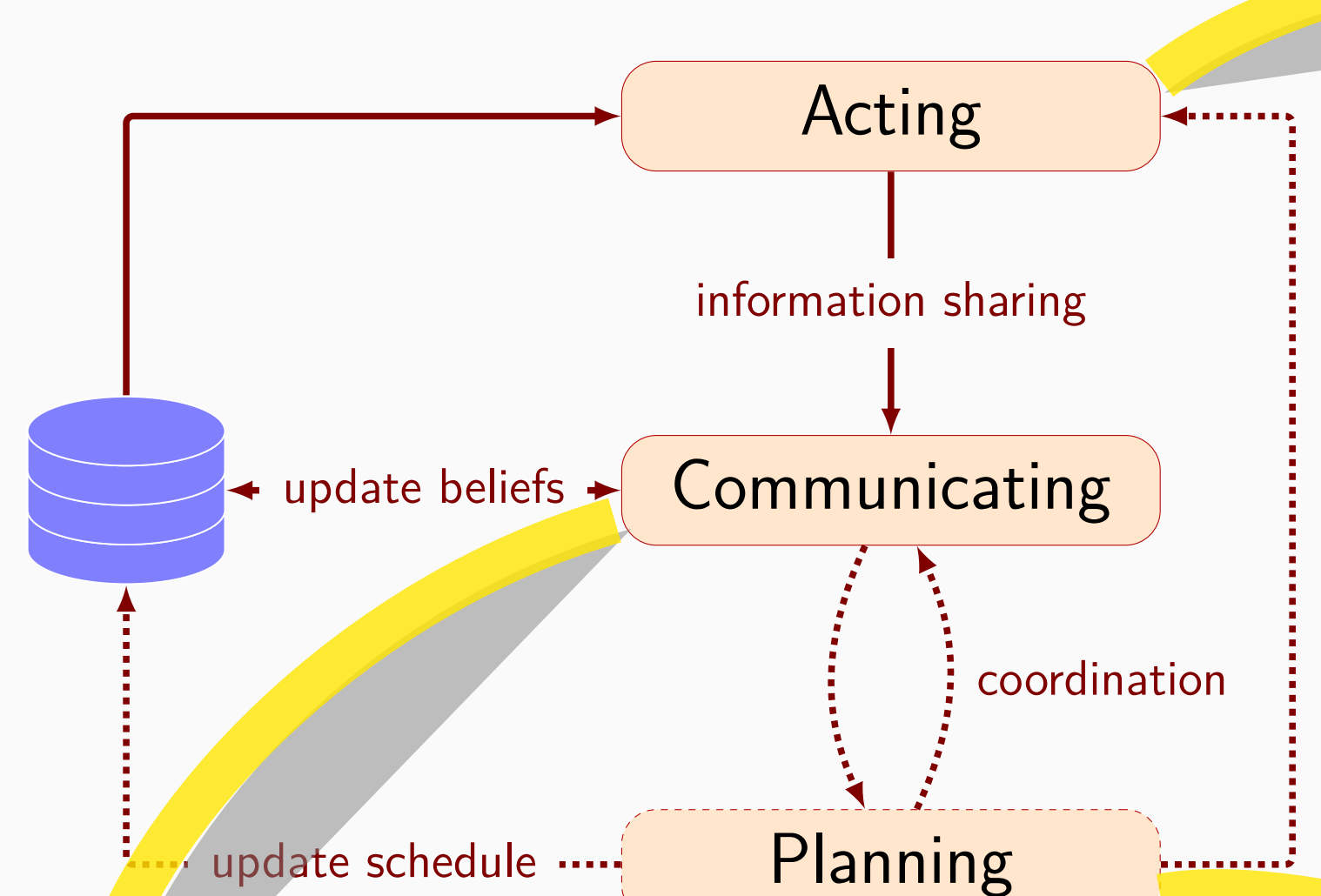
$$CM := \langle DA, AC, AM \rangle$$

- DA : level of decision autonomy centralized (C) / decentralized (D)
- AC : agents' cooperativeness level "sharing" (S) / "no-sharing" (N)
- AM : the allocation mechanism

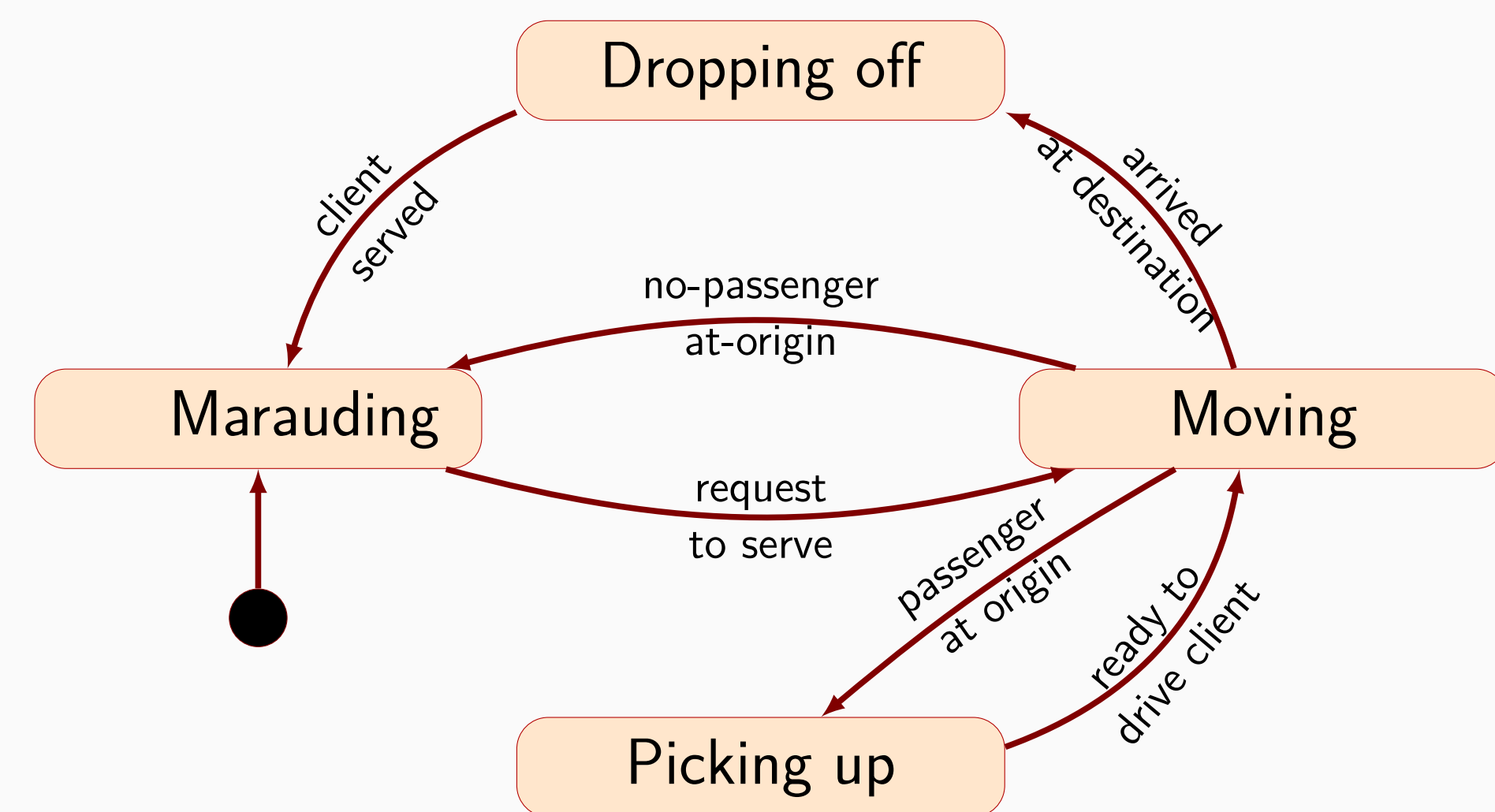
Implementation examples

- **Selfish**: $\langle D, N, Greedy \rangle$ [3]
- **Dispatching**: $\langle C, S, MILP \rangle$ [2]
- **Auctions**: $\langle D, S, Auction \rangle$ [1]
- **Cooperative**: $\langle D, S, DCOP \rangle$ MGM-2 solver [4] DSA solver [5] (variant A, $p = 0.5$)

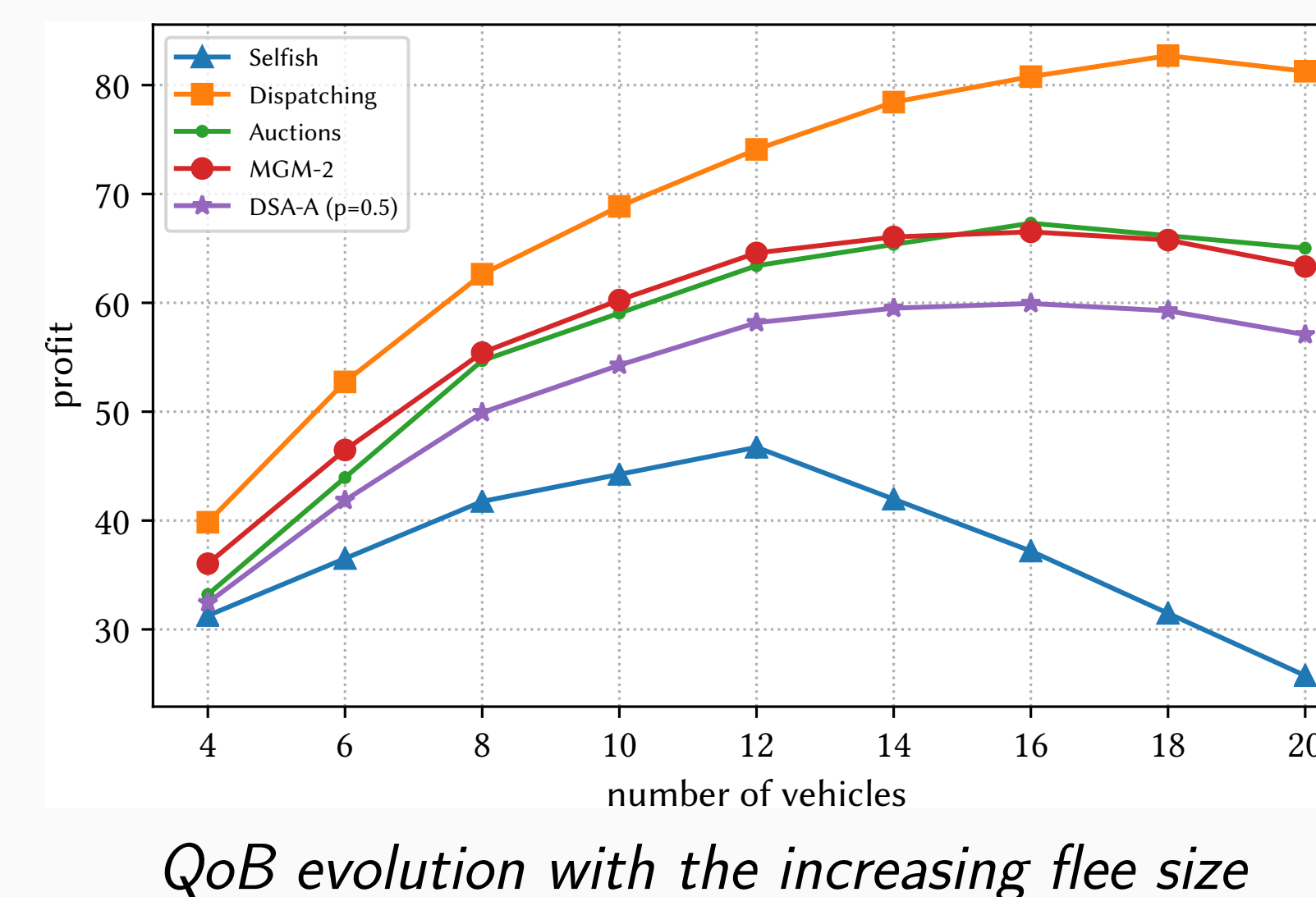
Generic AV Behavior



Acting Sub-behavior



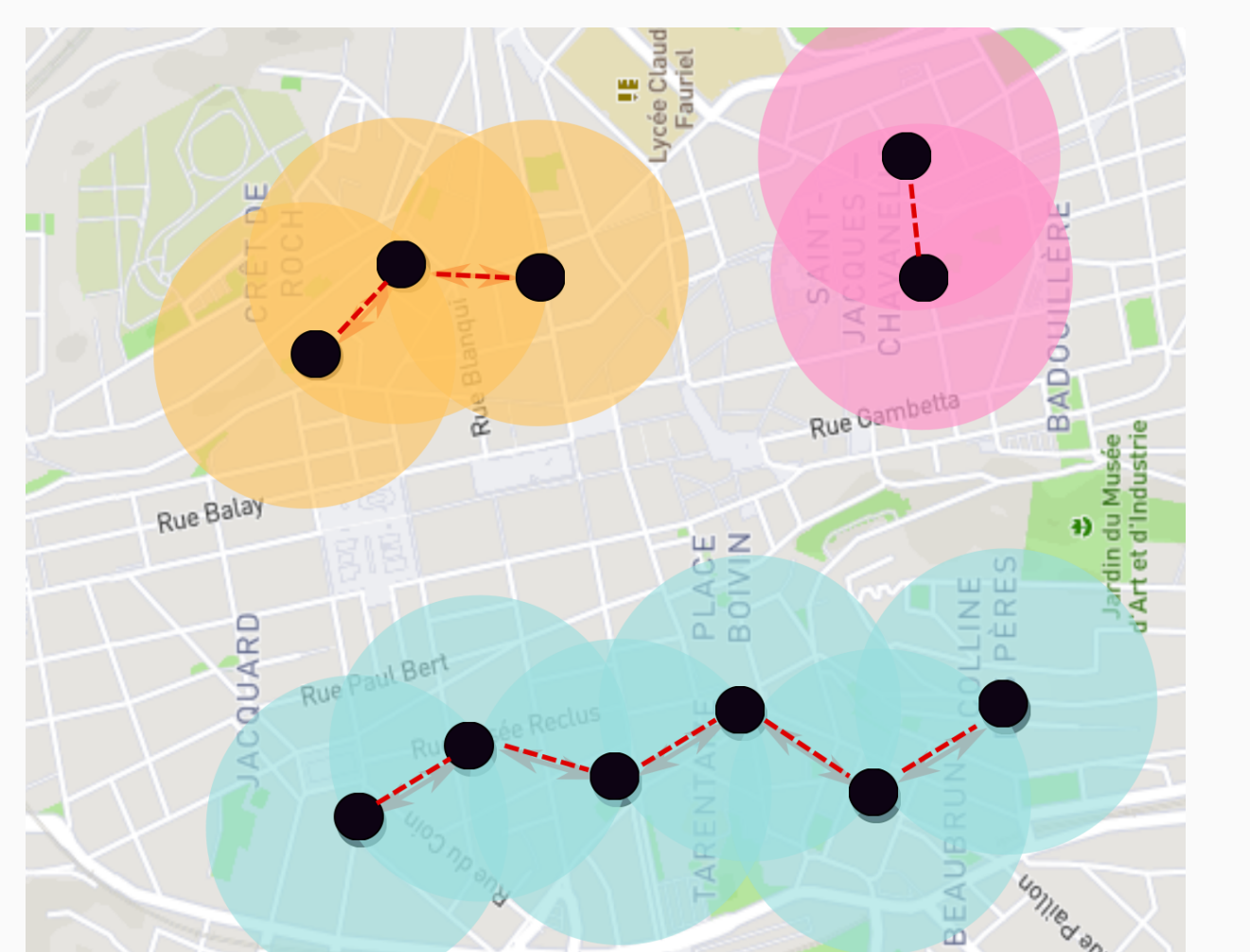
Evaluation



Coordination	message size		msg per agent	comm. load (MB)	reschedule rate
	max	avg			
Selfish	140	88	6	2.21	2.0
Dispatching	3500	168	21	11.2	3.0
Auctions	140	112	53	37.7	1.5
MGM-2	210	25	5040	297.6	12.0
DSA	236	20	5015	75.1	13.0

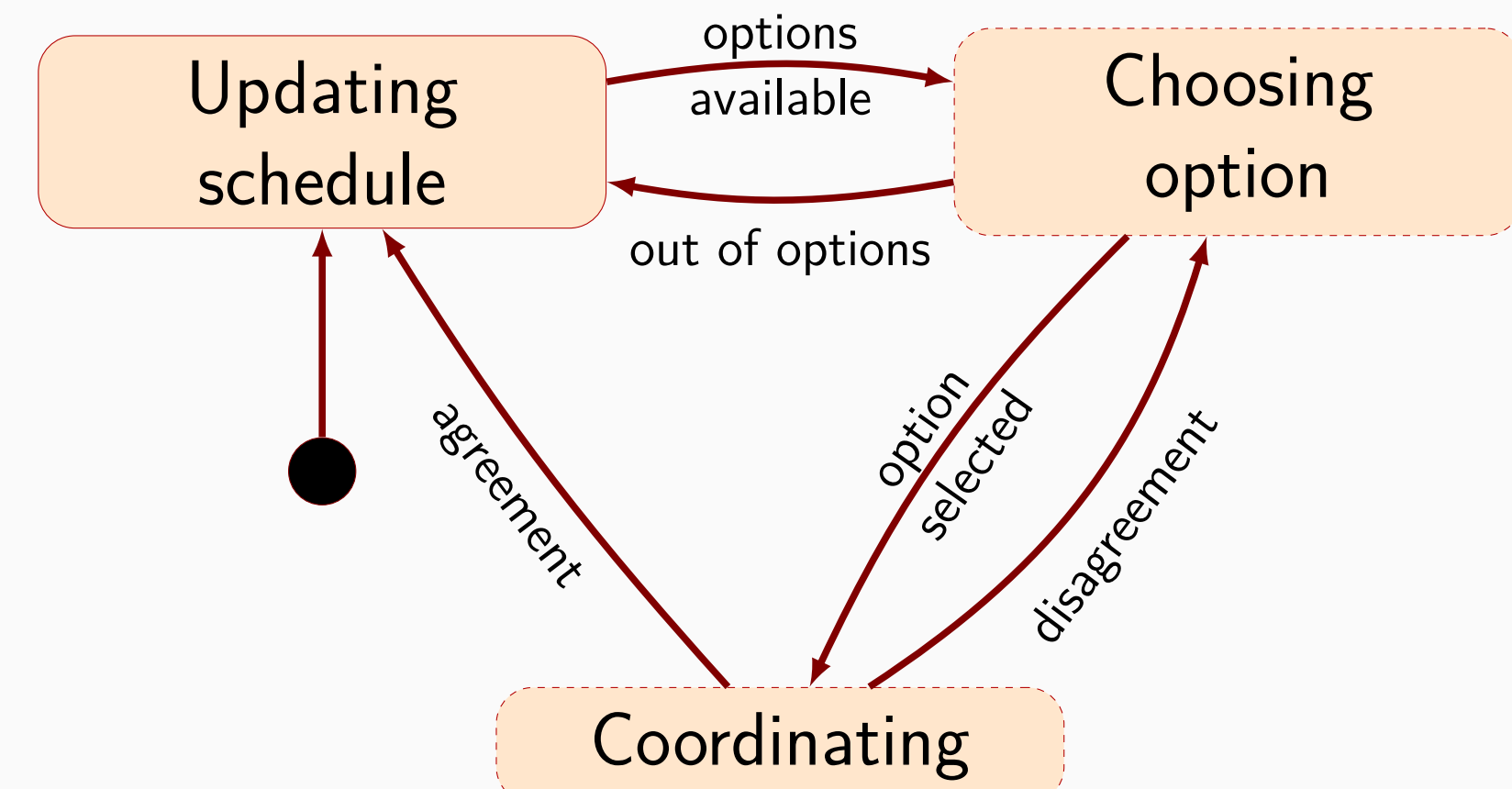
Metrics for scenarios with 10 vehicles

Communication Model



Vehicles form connected sets through their limited-range communication

Planning Sub-behavior



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