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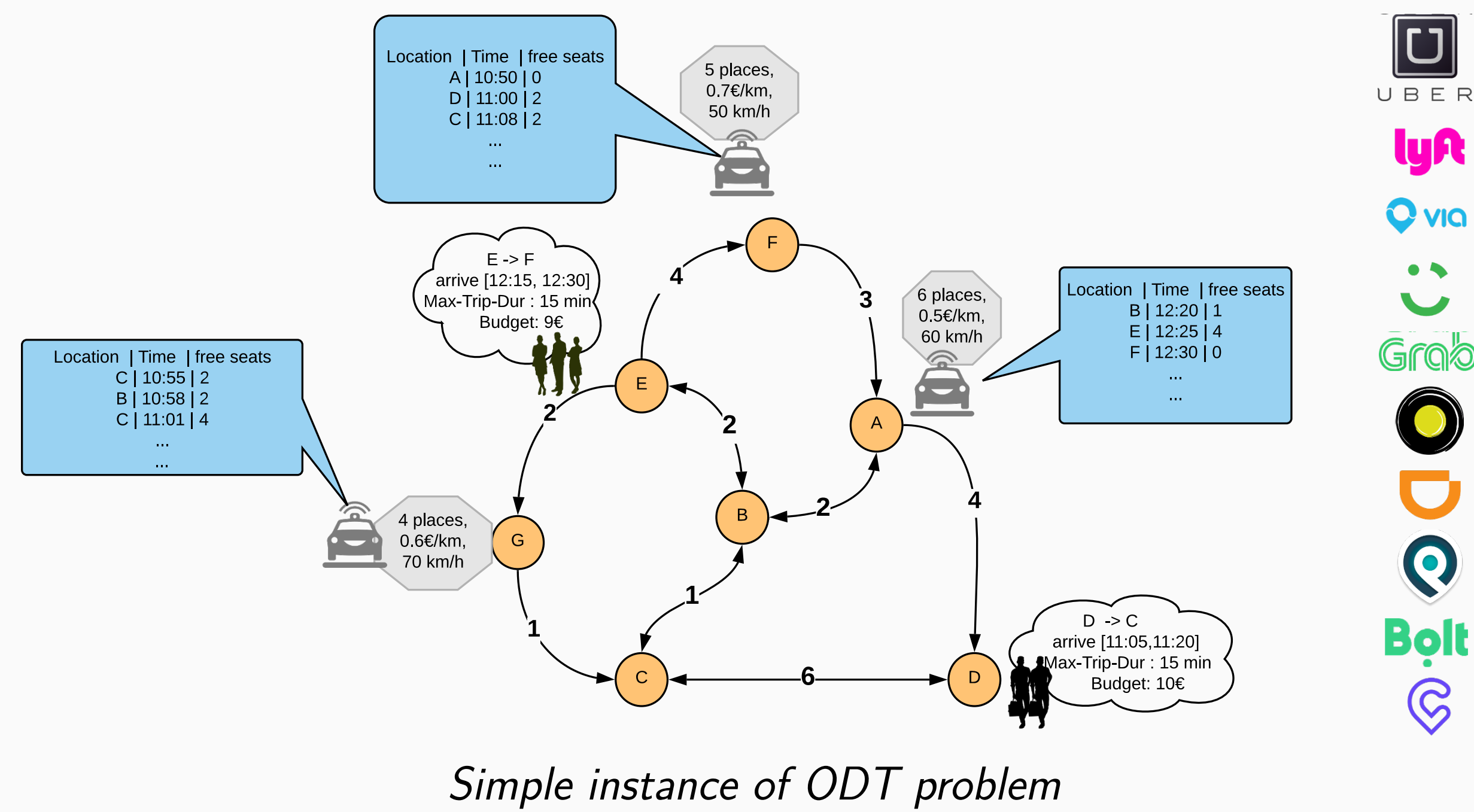
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# A GENERIC MULTI-AGENT MODEL FOR RESOURCE ALLOCATION STRATEGIES IN ONLINE ON-DEMAND TRANSPORT WITH AUTONOMOUS VEHICLES

Alaa DAOUD – Flavien BALBO – Paolo GIANESSI – Gauthier PICARD  
 alaa.daoud@emse.fr    flavien.balbo@emse.fr    paolo.gianessi@emse.fr    gauthier.picard@onera.fr

## 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)

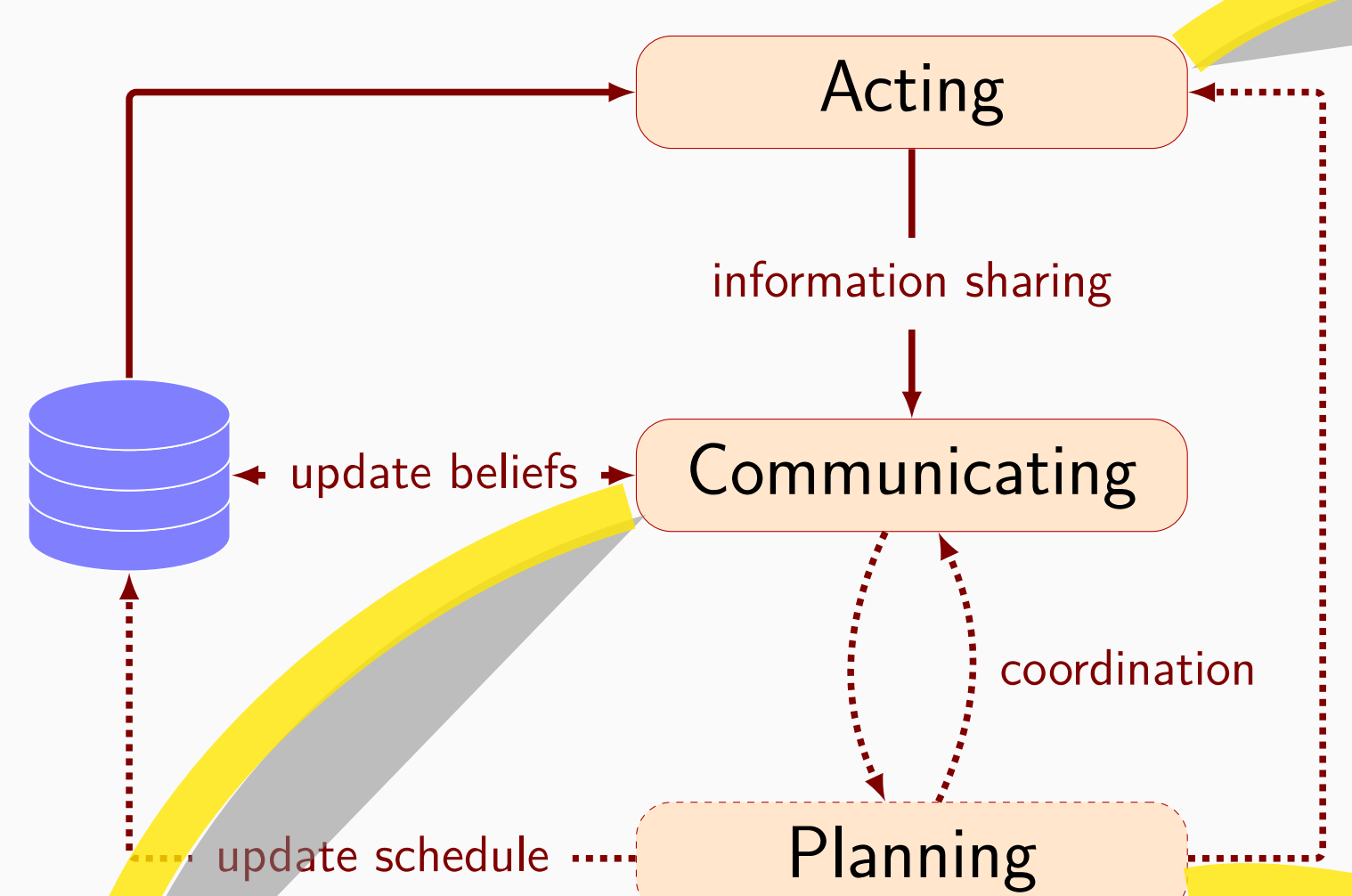
$$CM := \langle DA, AC, AM \rangle$$

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

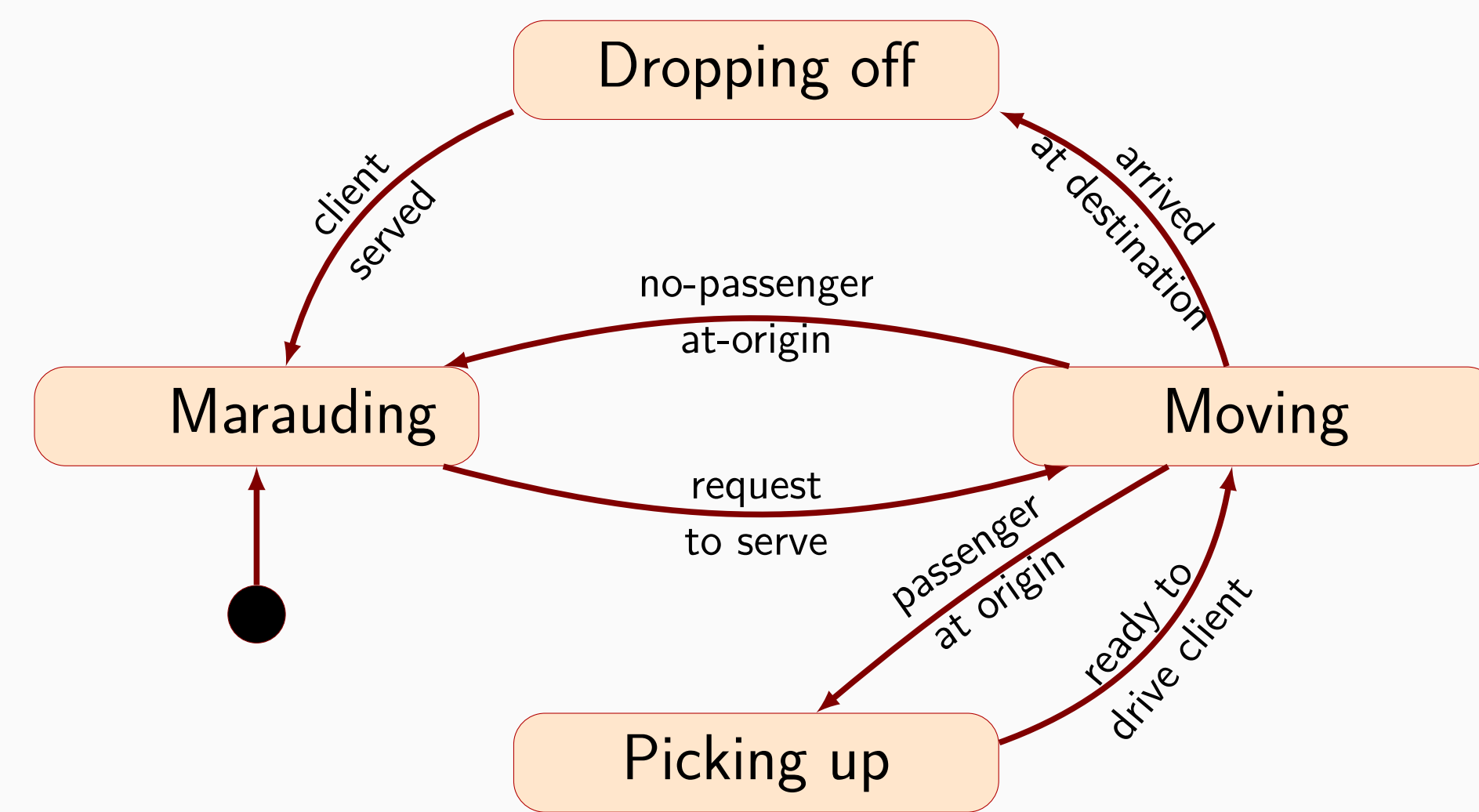
## Implementation examples

- **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,  $p = 0.5$ )

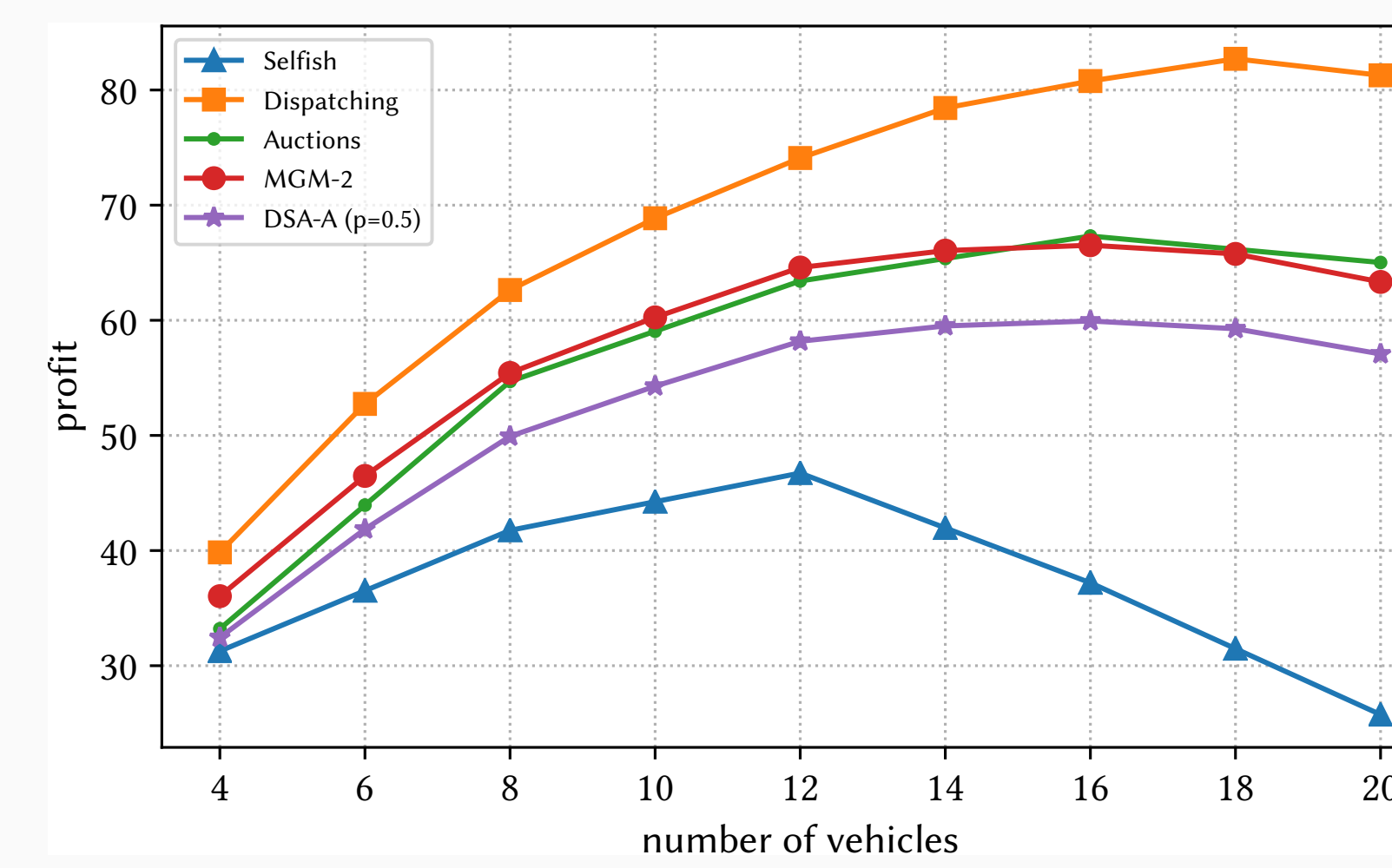
## Generic AV Behavior



## Acting Sub-behavior



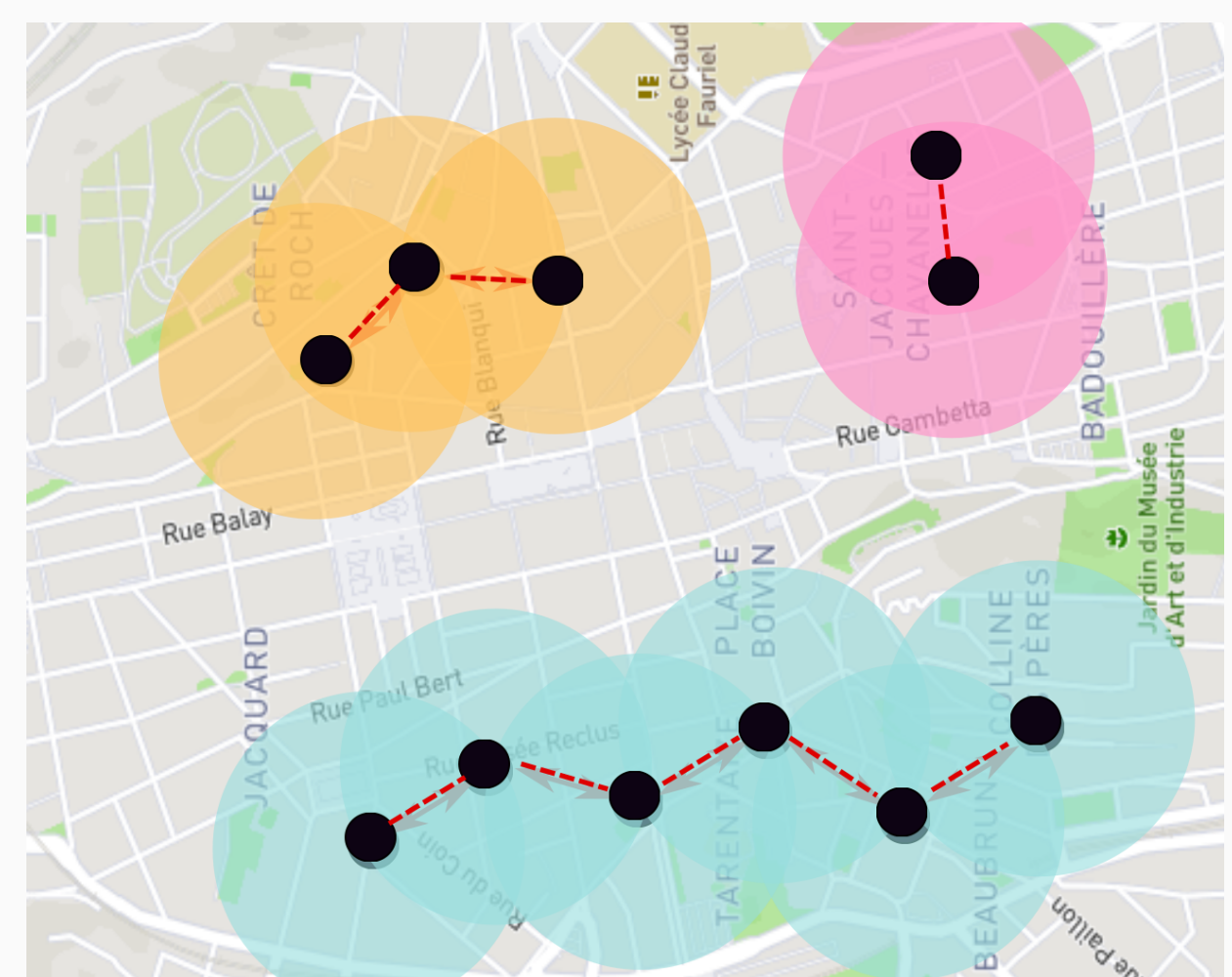
## Evaluation



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

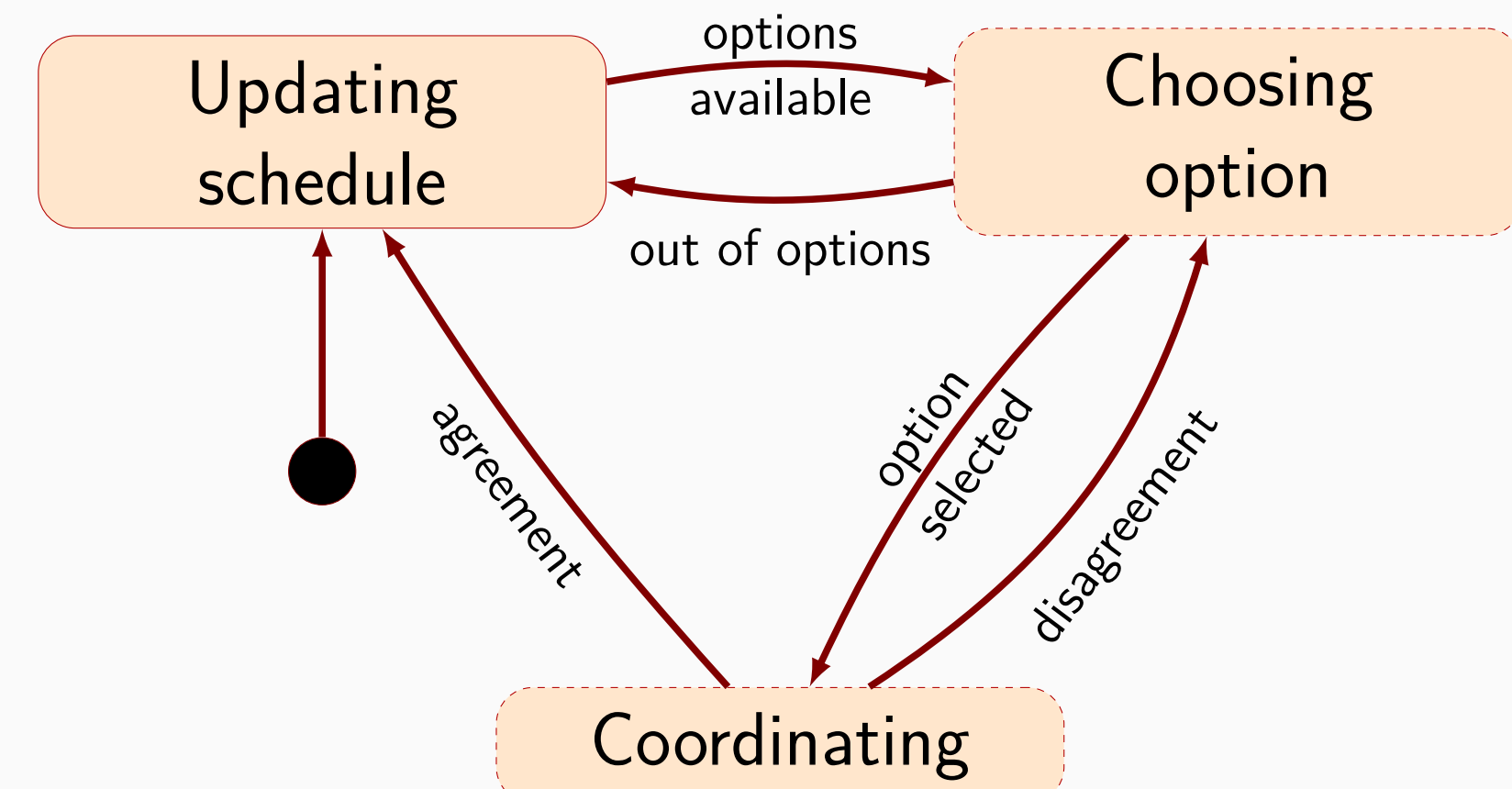
Metrics for scenarios with 10 vehicles

## Communication Model



Vehicles form connected sets through their limited-range communication

## Planning Sub-behavior



## References

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