

Household Vehicle Sharing in MATSim

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- 1 Vehicle Assignment in MATSim
- 2 Resource-constrained Replanning
- 3 Household Vehicle Sharing in MATSim
- 4 Discussion & Outlook

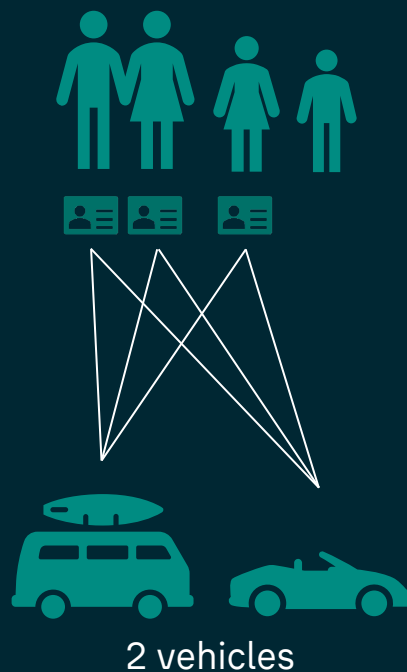


Vehicle Assignment in MATSim

Vehicle Assignment: HHTS vs. MATSim

Household Travel Survey (HHTS)

3 persons with driver's license



MATSim cannot share vehicles and will thus create too many cars.



- × Too high traffic flow
- × Too many parked cars

MATSim

3 agents with "carAvail" & "hasLicense"



Vehicle Assignment: HHTS vs. MATSim

Household Travel Survey (HHTS)

3 persons with driver's license



MATSim should choose a vehicle, that is "available".



MATSim

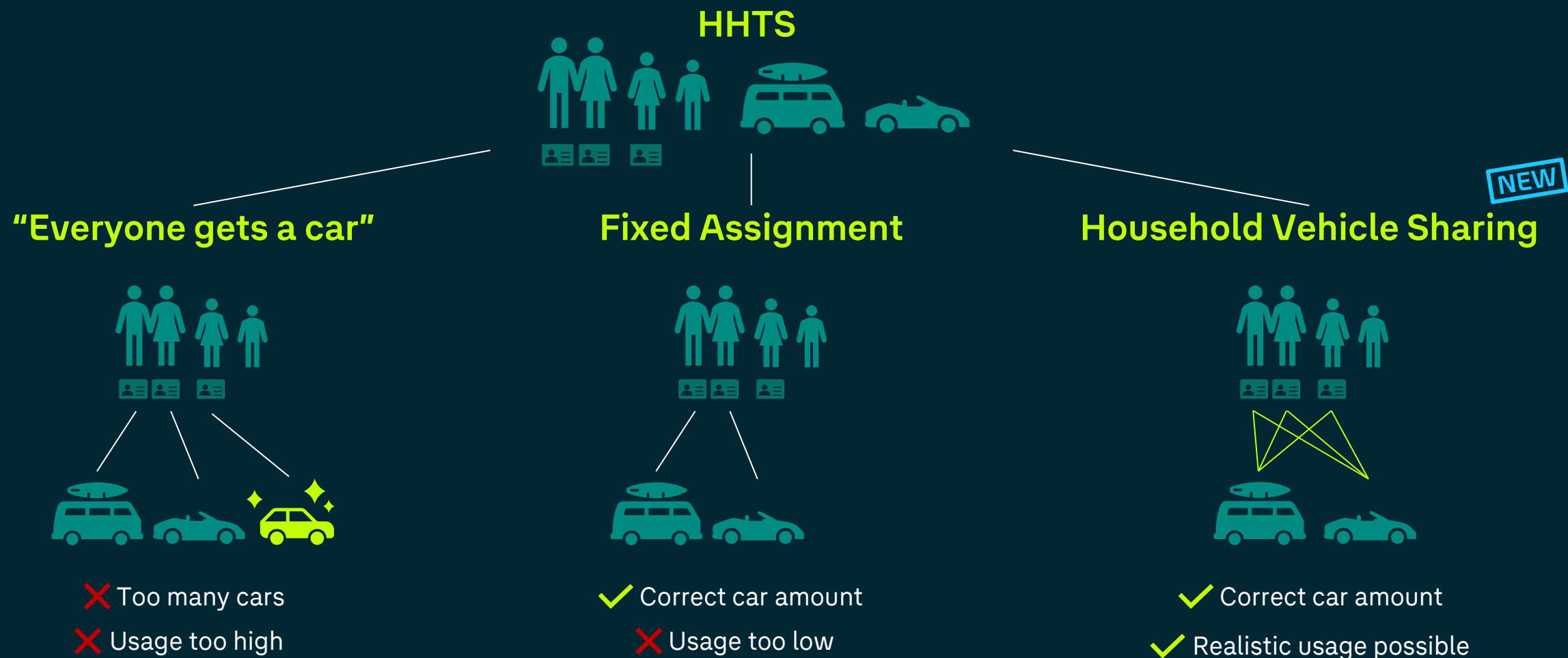
3 agents with "carAvail" & "hasLicense"



Requirements

- Household Context
- Sharing of Vehicles

Vehicle Assignment - 3 Options



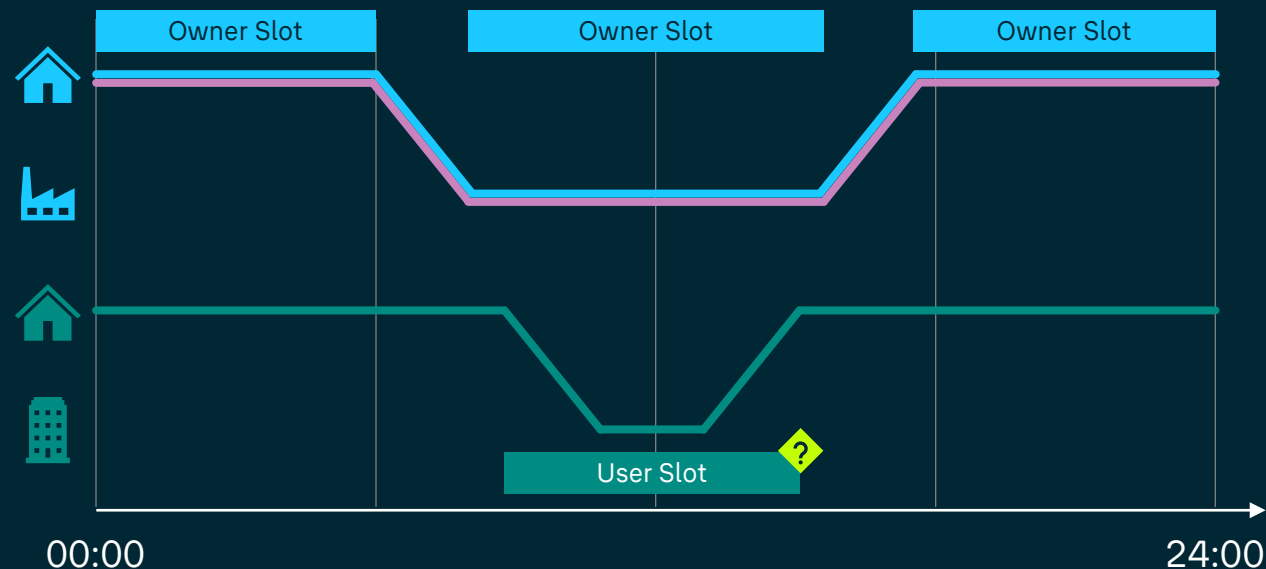
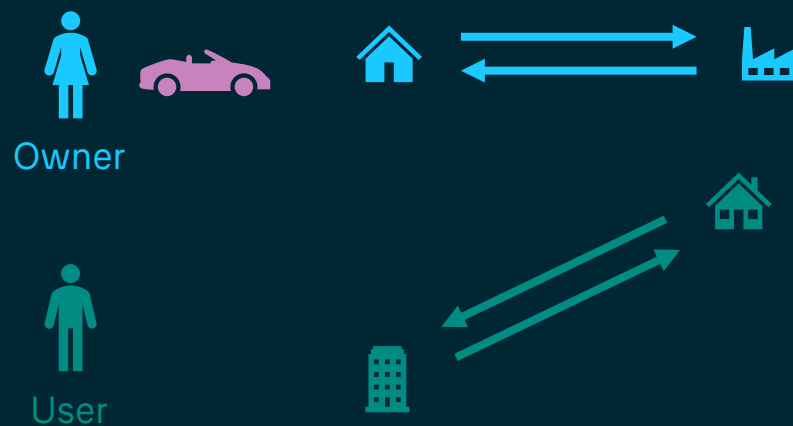


Resource-constrained Replanning

S. Hörl, J. Sobieraj, S. Axer and H. Rewald, "Resource-constrained replanning in MATSim applied to the simulation of peer-to-peer car sharing services", *Procedia Computer Science*, vol. 220, pp. 698-703, 2023. <https://www.sciencedirect.com/science/article/pii/S1877050923006269>

Resource-constrained Replanning

Allow usage of vehicles by other agents



Agent Blue takes its car to work
Agent Green takes the bus to work.

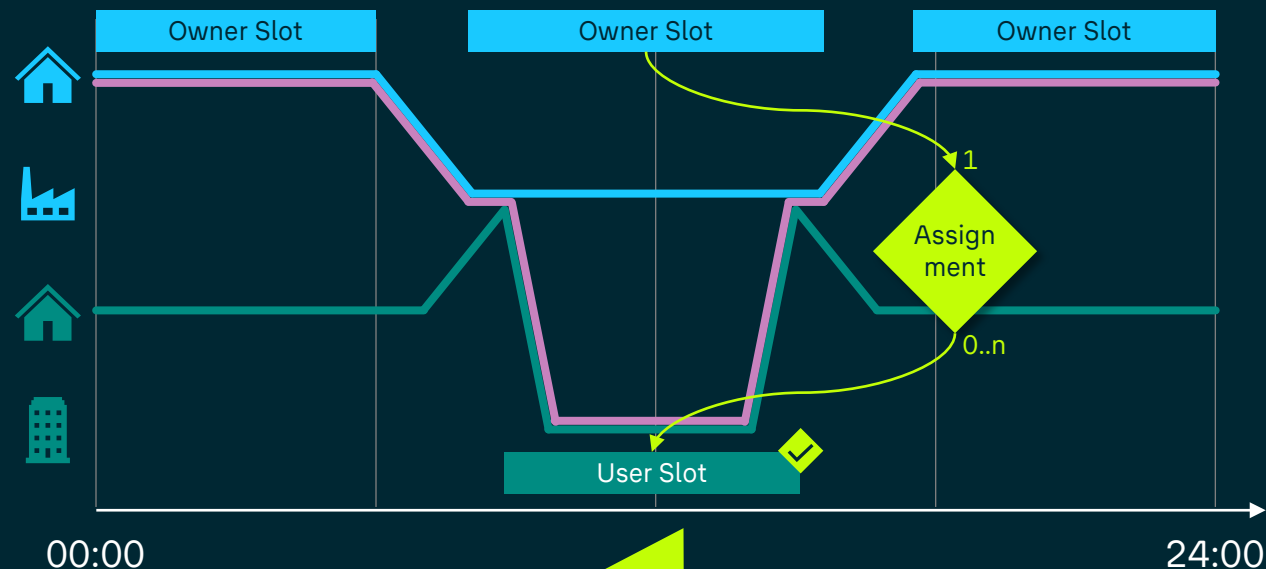
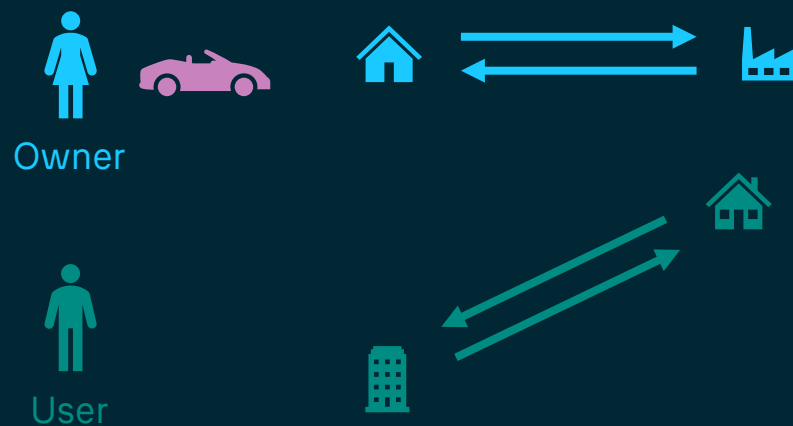
Agent Green takes the bus home.
Agent Blue takes its car to home.

Every Owner Activity is an Owner Slot

Every User Subtour is a User Slot

Resource-constrained Replanning

Allow usage of vehicles by other agents



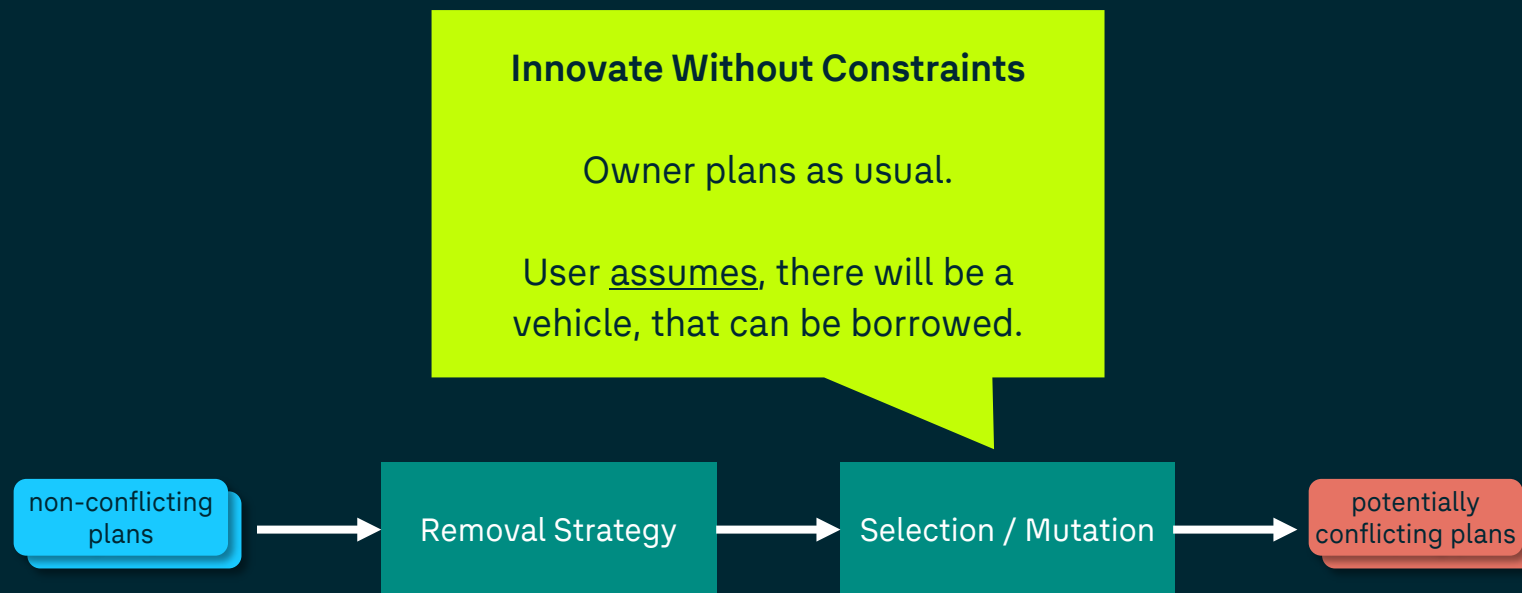
Agent Blue takes its car to work
Agent Green walks to Blue's car.
Agent Green takes it to work, and back to Blue's work.
Agent Green walks home.
Agent Blue takes its car to home.

Potential Conflicts To Resolve:

- No matching owner slot
- Double bookings
- Late returns

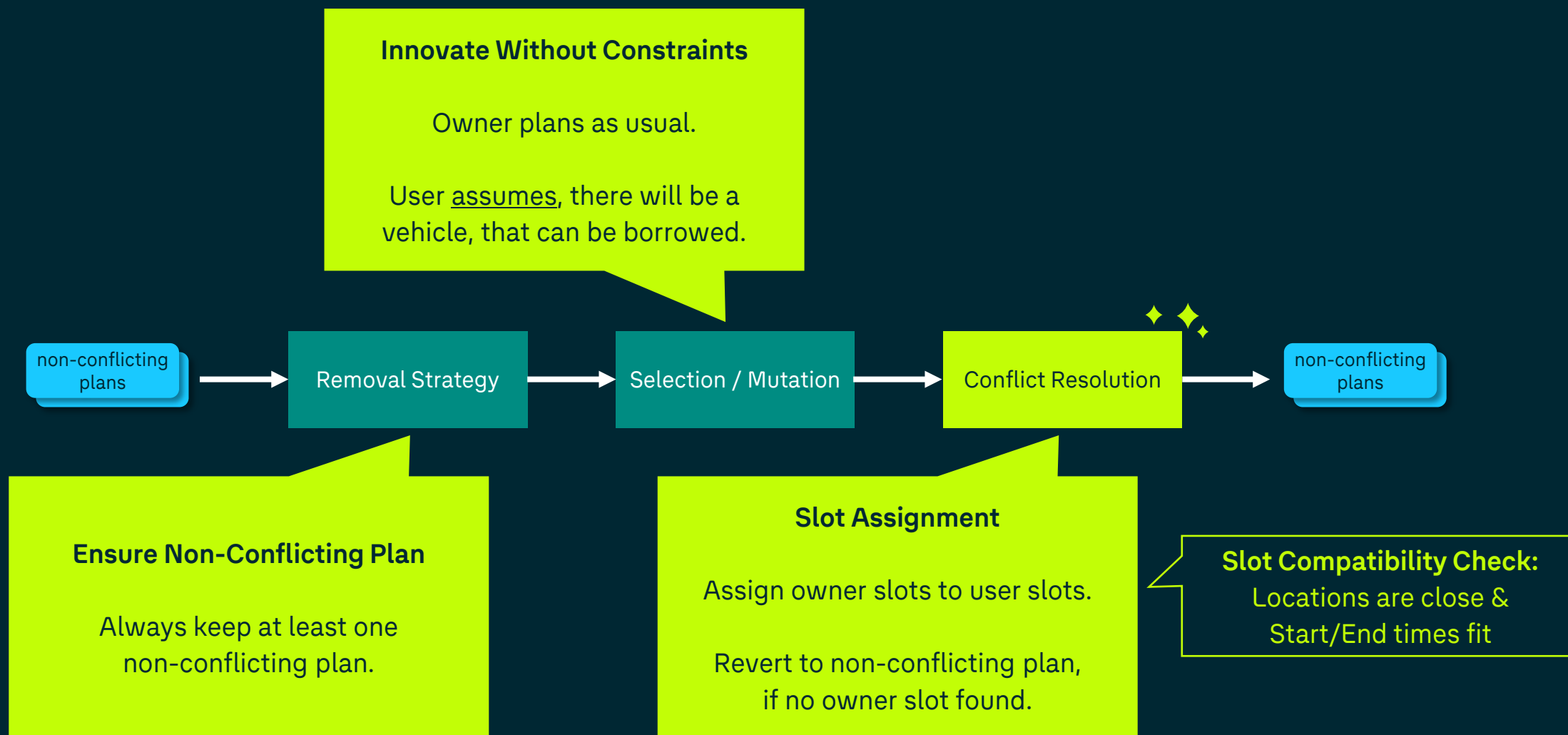
Resource-constrained Replanning

Ensure non-conflicting plans



Resource-constrained Replanning

Ensure non-conflicting plans

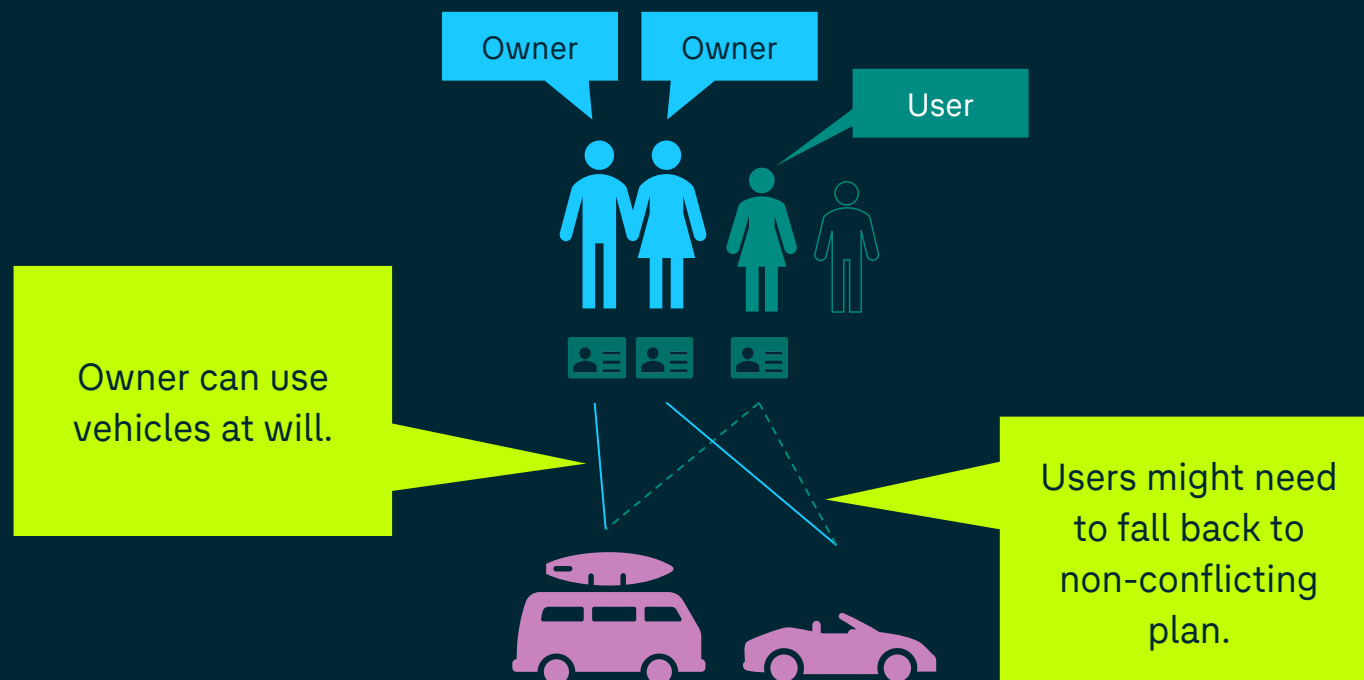




Household Vehicle Sharing in MATSim

Household Vehicle Sharing in MATSim

Assigning vehicle owners and users

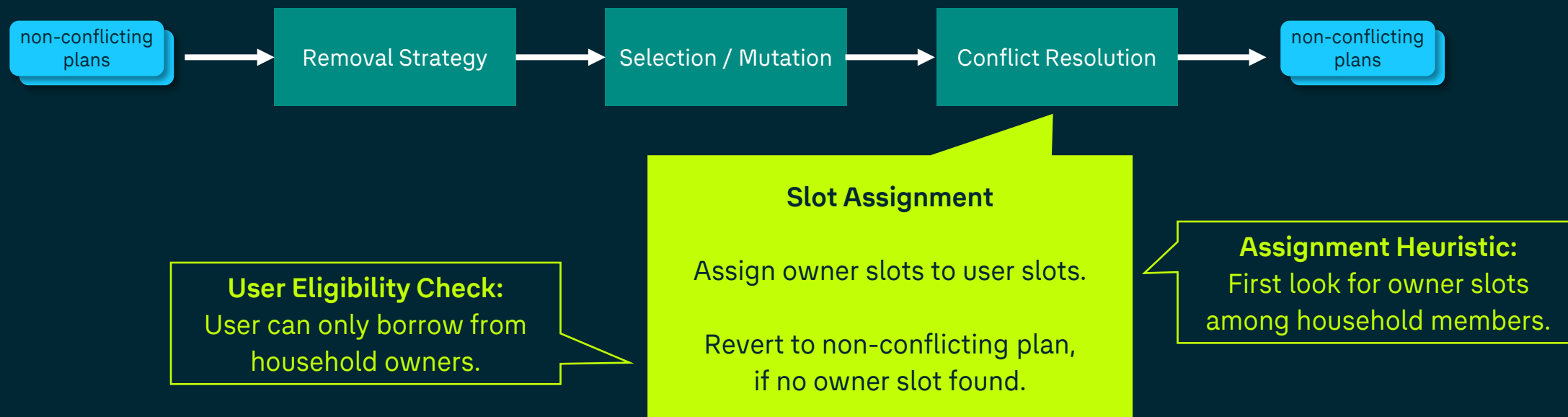


"Car Usage Affinity" Sort Order

- Above 18?
- Having License?
- Car distance driven in HHTS (descending)
- Not having a PT season ticket vs. having
- Commute distance in HHTS (desc.)
- Overall plan distance in HHTS (desc.)
- Age (desc.)

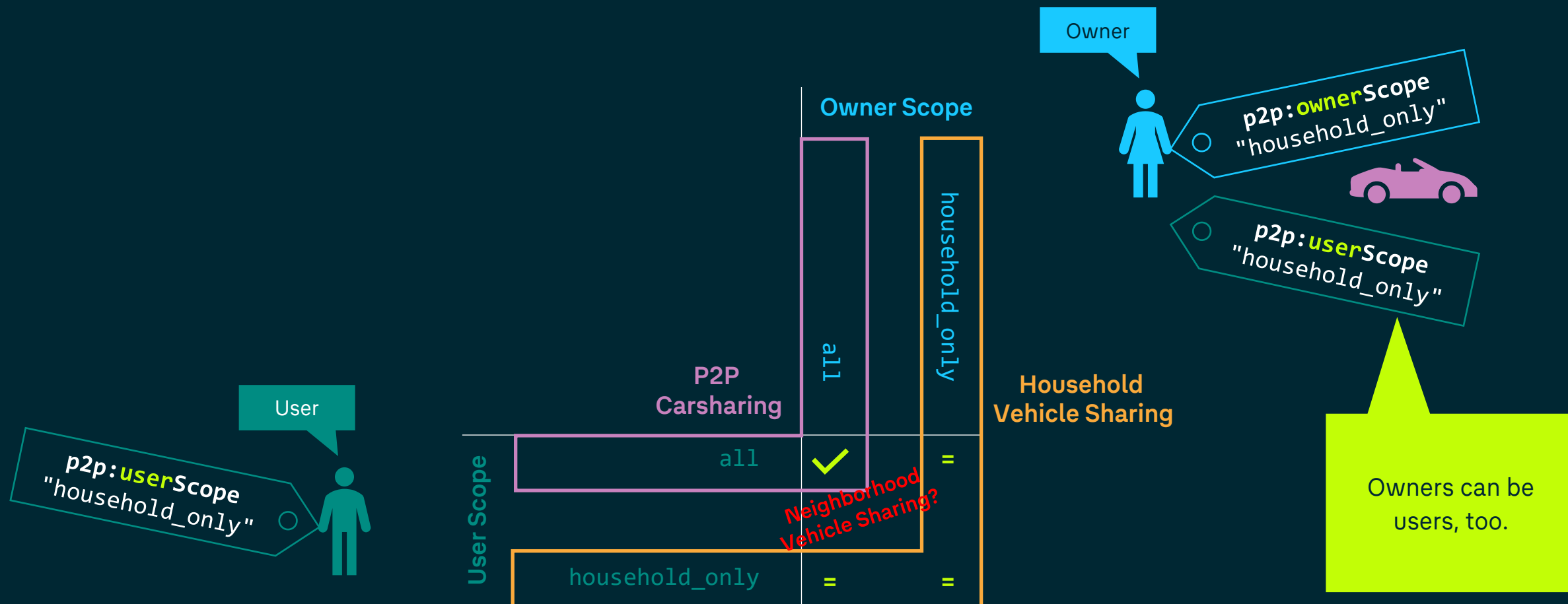
Household Vehicle Sharing in MATSim

General P2P-Carsharing vs. Household Vehicle Sharing



Household Vehicle Sharing in MATSim

Eligibility check during slot assignment





Discussion & Outlook

Discussion & Outlook

- **Affects Calibration & Results**
 - We should communicate, what of the 3 options we used
- **Allows for more realistic KPIs**
 - car usage ratio
 - parked car volumes
 - peak car flows
- **Allows for new scenarios & policy cases**
 - How many cars are actually used?
 - Remove one car of multi-car households?
 - Impact of neighborhood carsharing?
 - ...
- **Resource-constrained Replanning**
 - Rent-out private parking space in city?
 - Share unused private EV chargers?
- **Are all household members with a license allowed to drive the family car?**
- **Performance**
 - Slot assignment is rather negligible
 - Shared vehicles are DynAgents -> performance hit in mobsim
 - not necessary for simple non-AD household sharing
 - Improve performance of DynAgents in mobsim

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Thank You

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