



Micro-hub in a historic city centre: the challenges and opportunities

Zisis Maleas

Hellenic Institute of Transport - CERTH





Micro – Hubs specifications



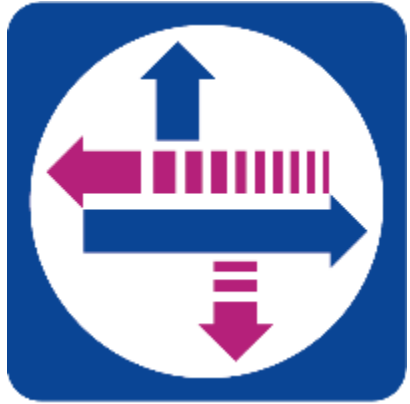
Location: Typically located in easily accessible areas, often in close **proximity** to the final delivery destination (e.g., near residential areas, office complexes, or transit centers).



Size: Smaller than traditional warehouses or distribution centers, making them more **suitable for integration** into urban environments.



Functionality: Can serve **multiple functions**, from being a simple parcel pick-up point to a more complex distribution center that handles sorting and last-mile delivery logistics.



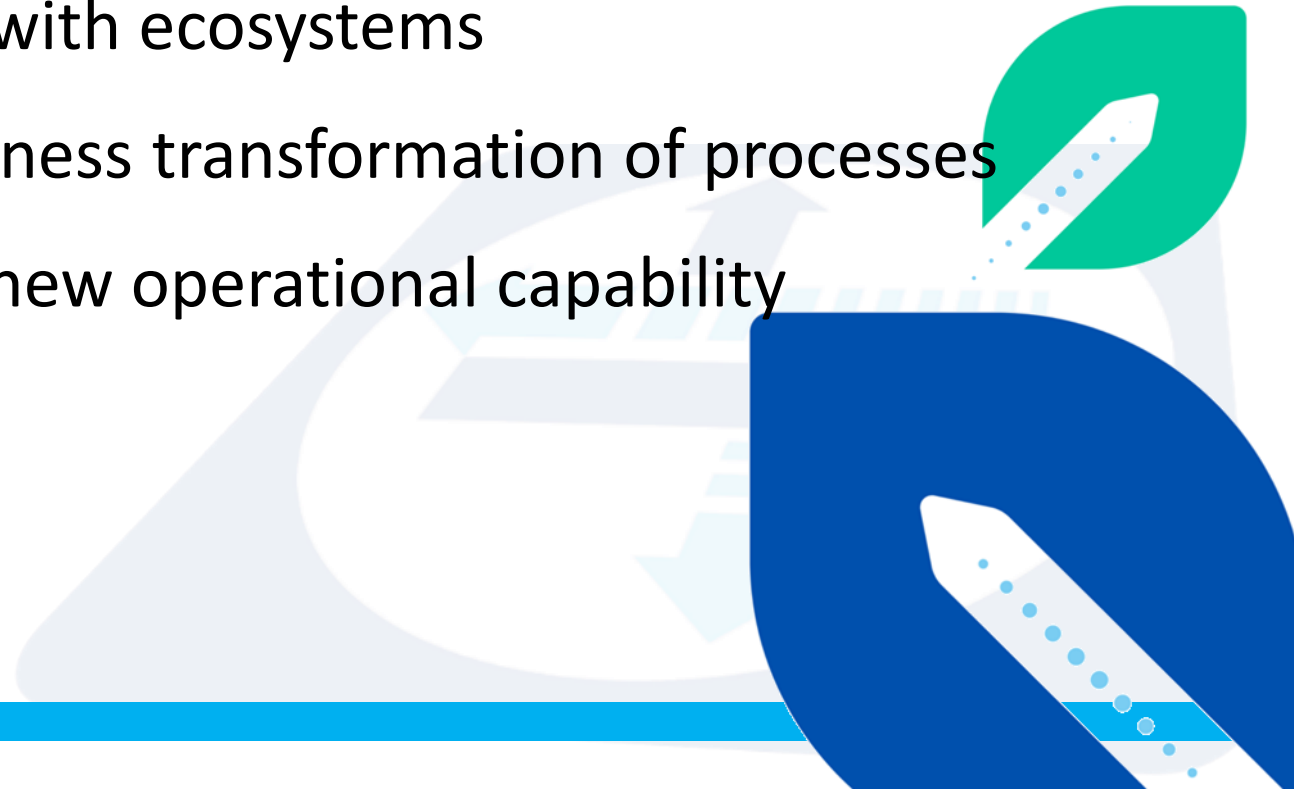
Micro – Hubs Challenges





Micro – Hubs Challenges (Business Perspective)

- **Space Constraints:** Finding suitable locations in dense urban areas can be challenging if all companies should install their own infrastructure
- **Integration** and collaboration with ecosystems
- **Technology adoption** and business transformation of processes
- **Investment costs** : To acquire new operational capability





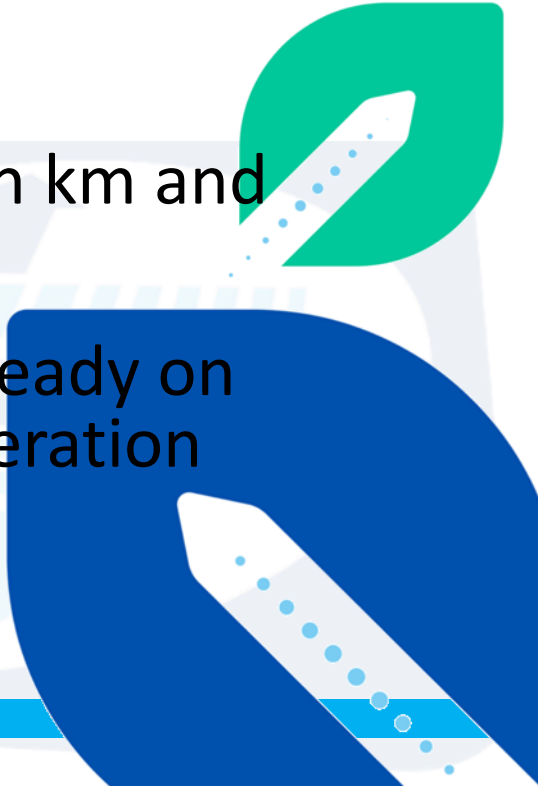
Micro – Hubs Challenges (End User)

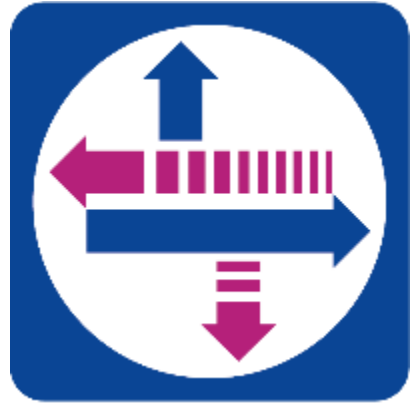
- **Increasing demand for E-commerce**
- **User Experience and Technology Adoption**
- **Flexibility and Responsiveness**
- **Accessibility and Convenience**
- **Sustainability and Environmental awareness**





Micro – Hubs Challenges (City based challenges)

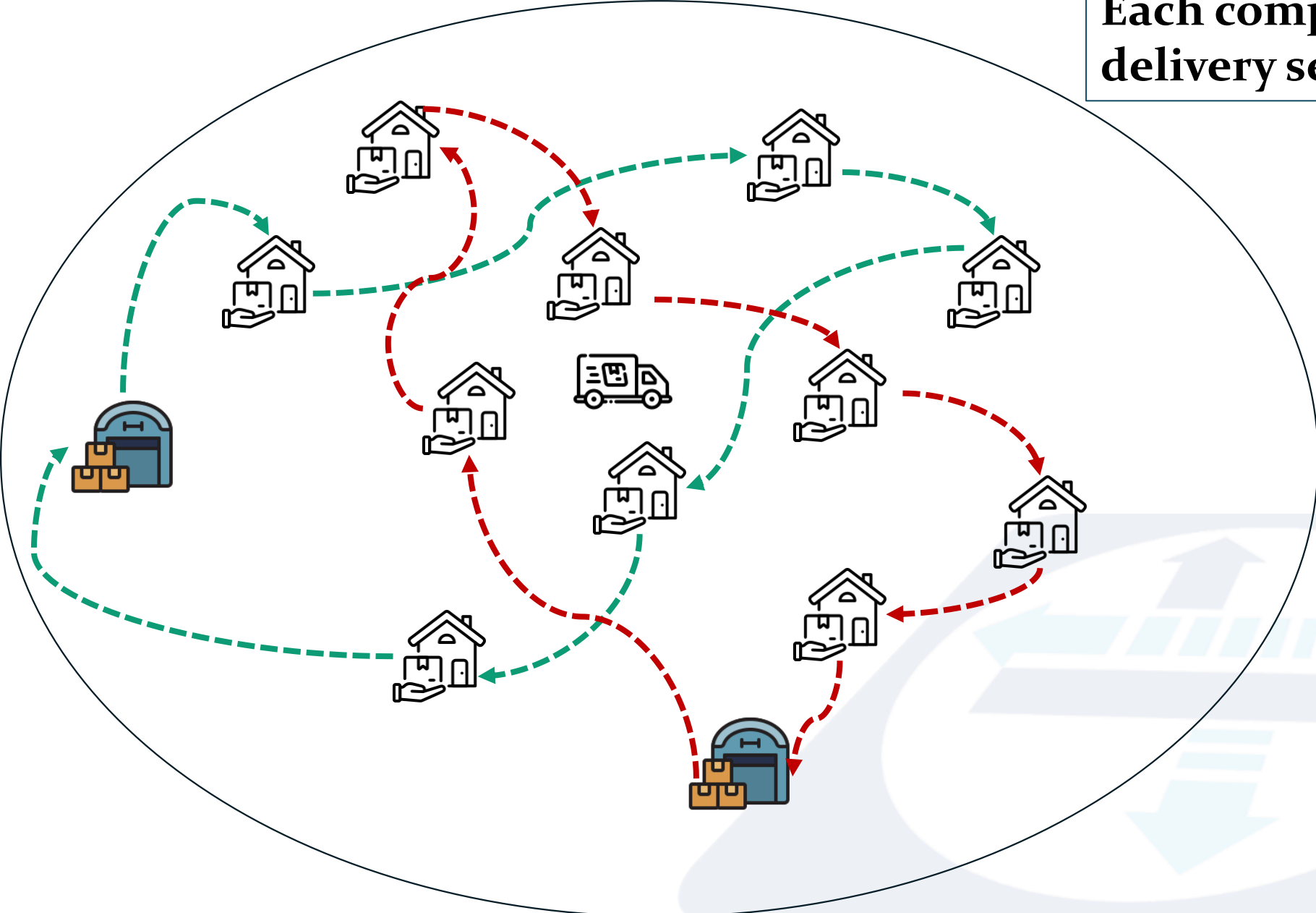
- **Empty and unused building** and places in dense urban areas or on near districts
 - **Enabling End Customer (Citizen)** to participate on delivery process and be part of the delivery (effort, technology adoption)
 - **Traffic and Congestion** reduction based on fewer driven km and fewer vehicles entering the area
 - To adopt **Zoning and Land Use Regulations** should be ready on how to organize and coordinate the future last mile operation
 - **Noise and Air pollution**
- 

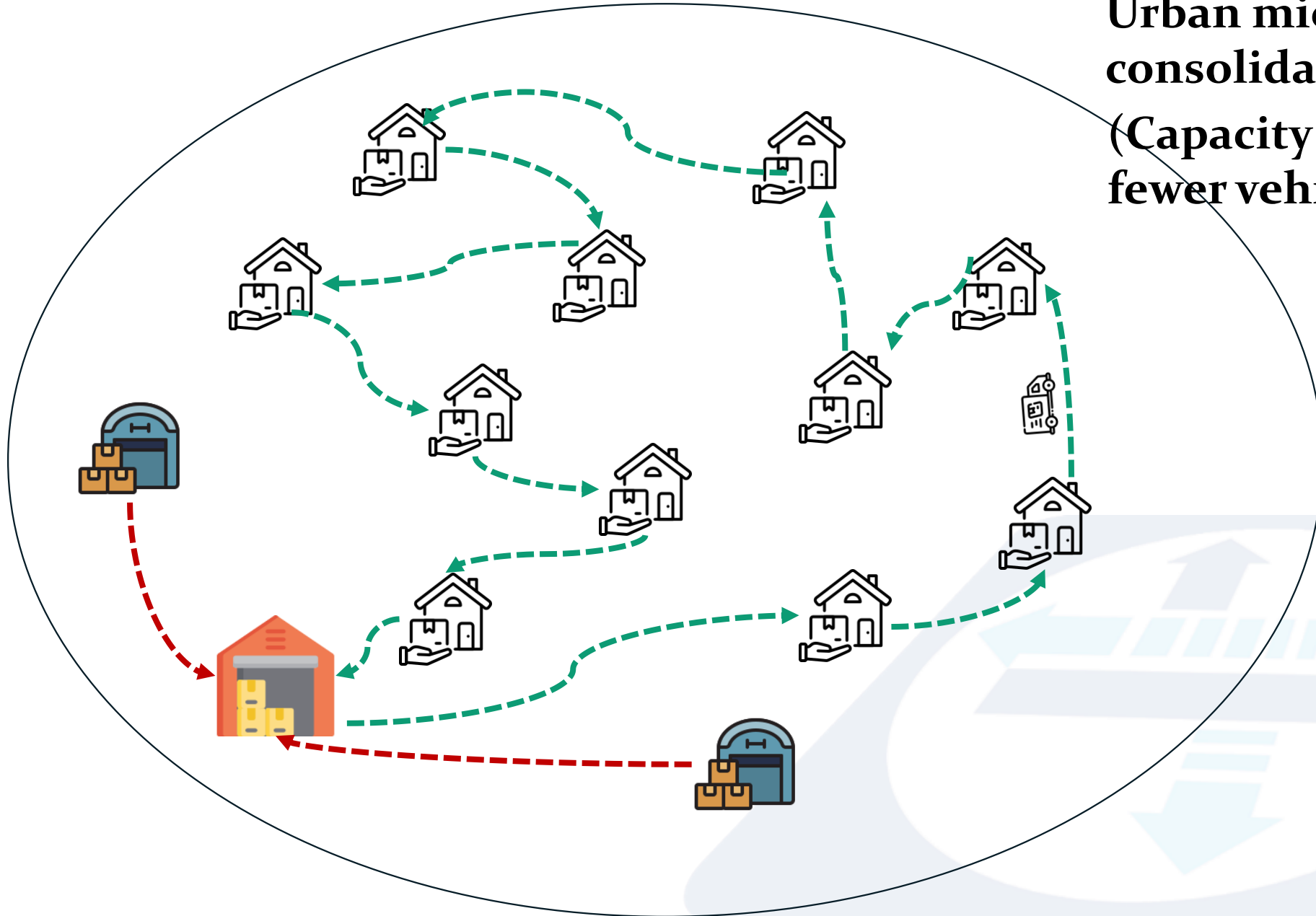


Micro – Hubs Opportunities

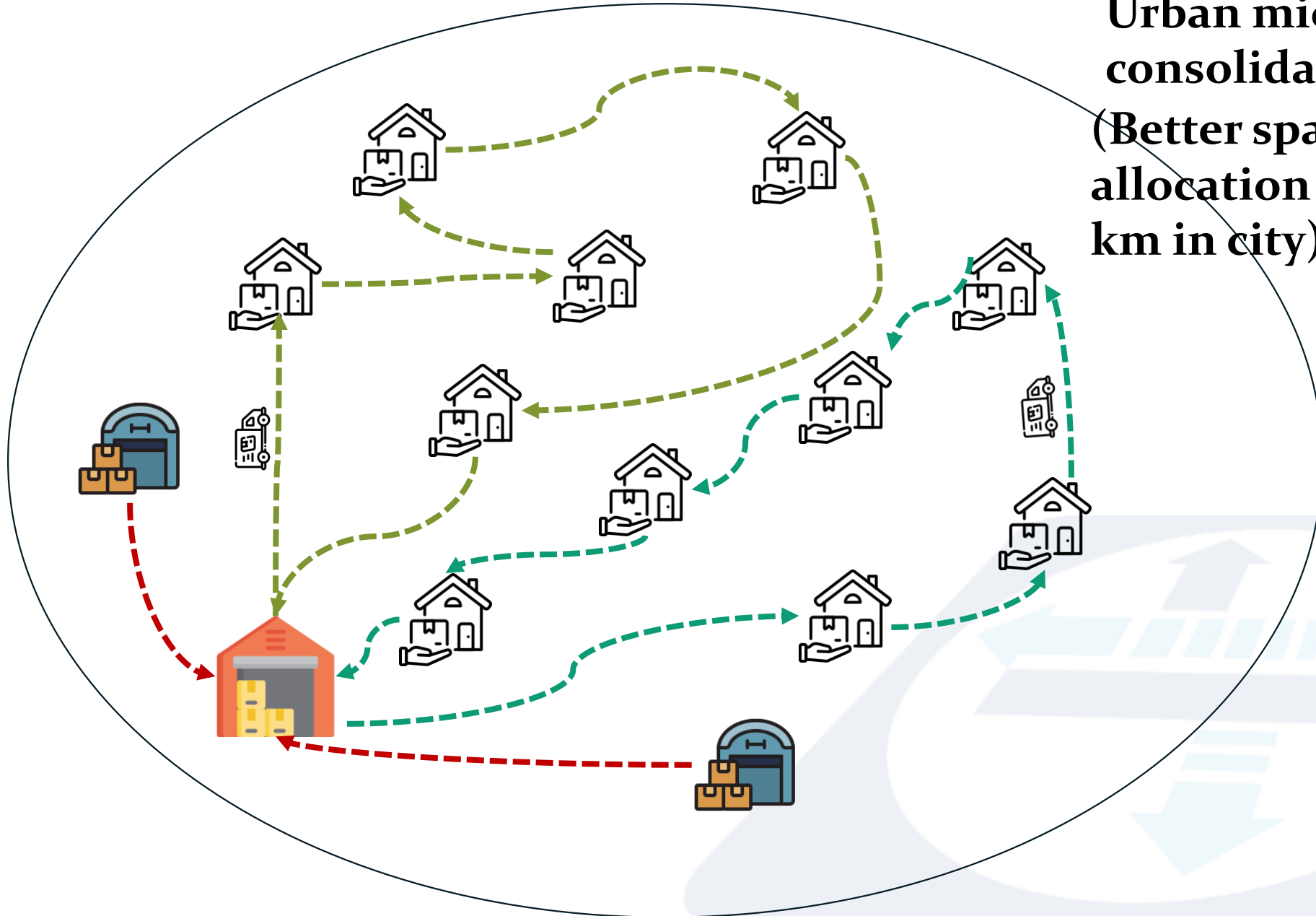


**Each company
delivery separately**

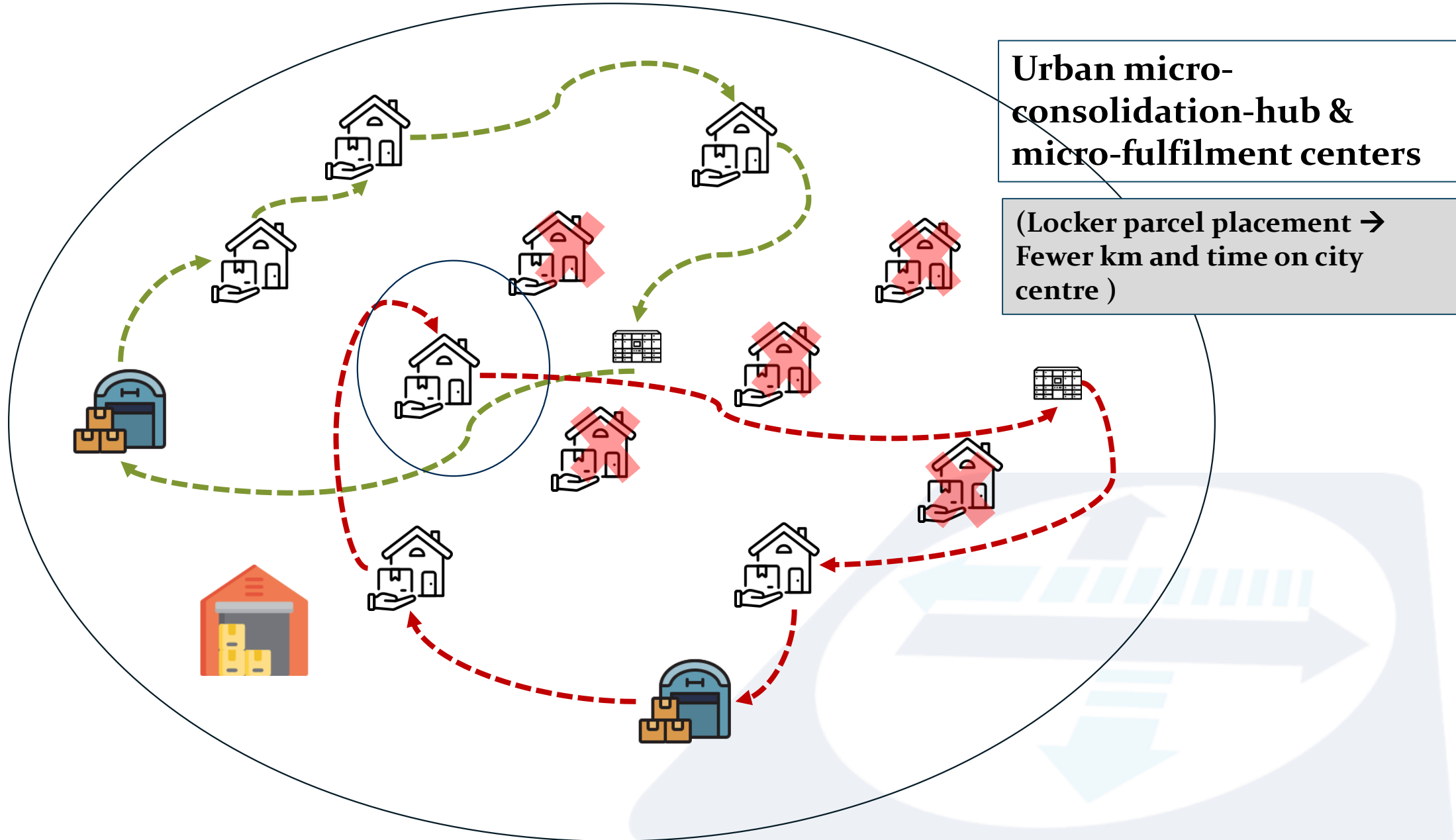


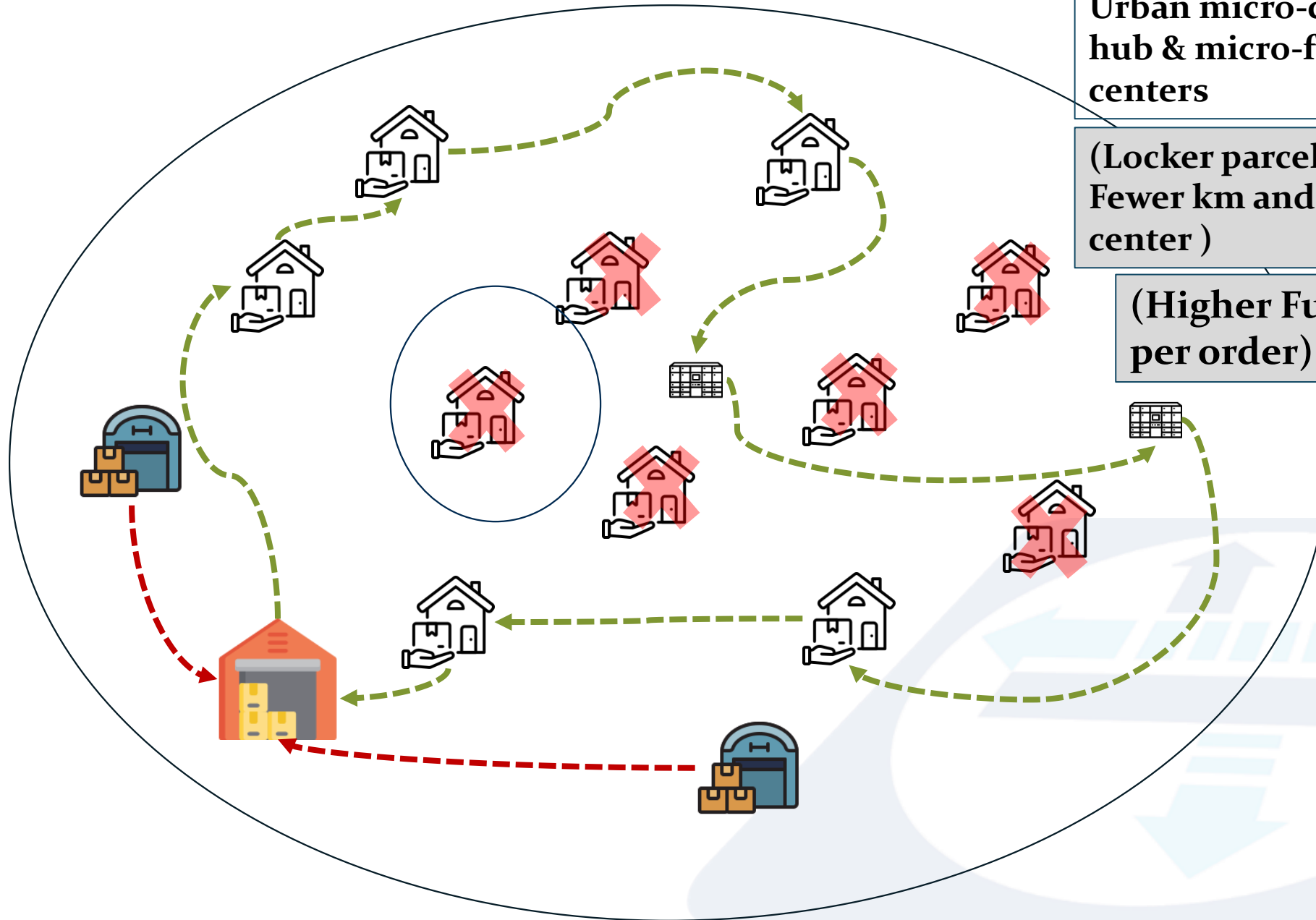


**Urban micro-
consolidation-hub**
(Capacity usage →
fewer vehicles in city)



Urban micro-consolidation-hub
(Better spatial vehicle allocation → fewer km in city)





Urban micro-consolidation-hub & micro-fulfilment centers

(Locker parcel placement → Fewer km and time on city center)

(Higher Fulfilment Rate per order)



Important System Parameters



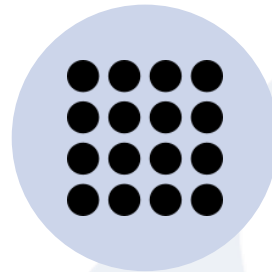
Pickup rate/speed → *The time takes for a customer to pick a parcel*



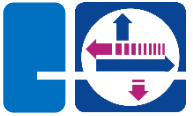
Parcel placement per courier arrival → *Number of orders placed by a single visit*



Vehicles per day operate the network → *How many vehicles (and drivers) needed to fulfil the hubs*



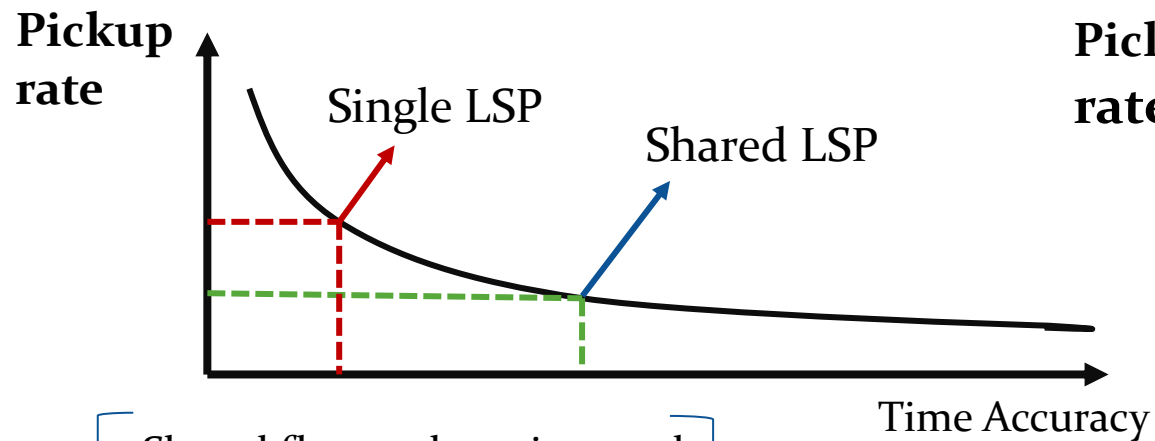
Micro-hubs per km² → *Lowering the number of hubs requires less public space and operations costs (caused by stochasticity)*



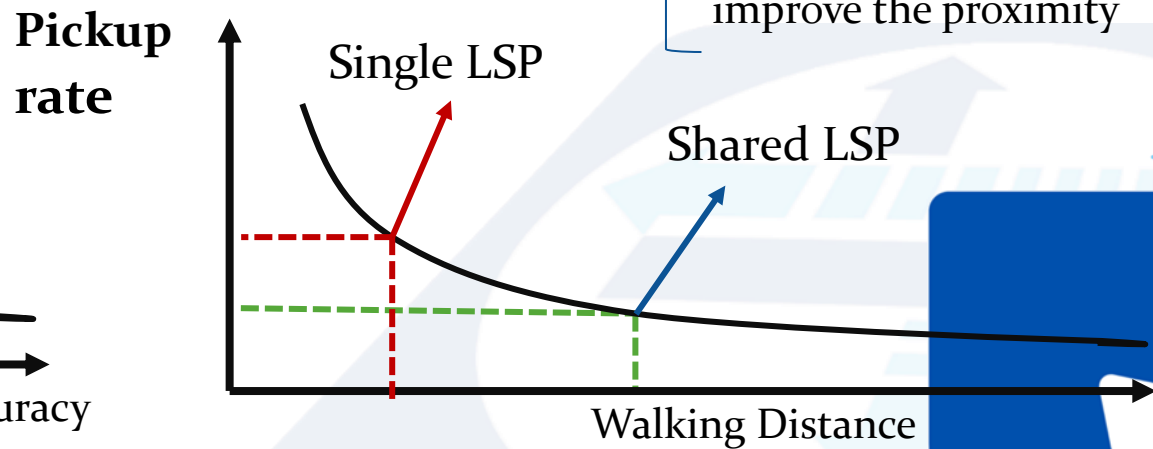
Important System Parameters



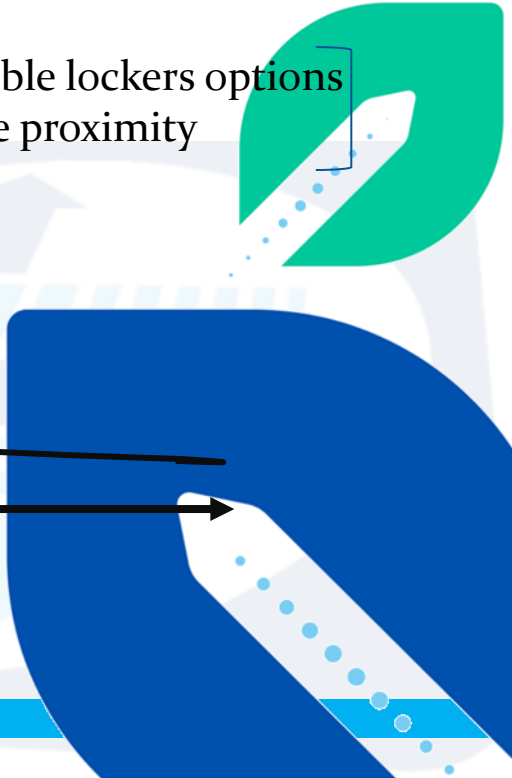
Pickup rate/speed →
The time takes for a customer to pick a parcel



Shared fleet and routing can be more accurate on desired time



More available lockers options improve the proximity

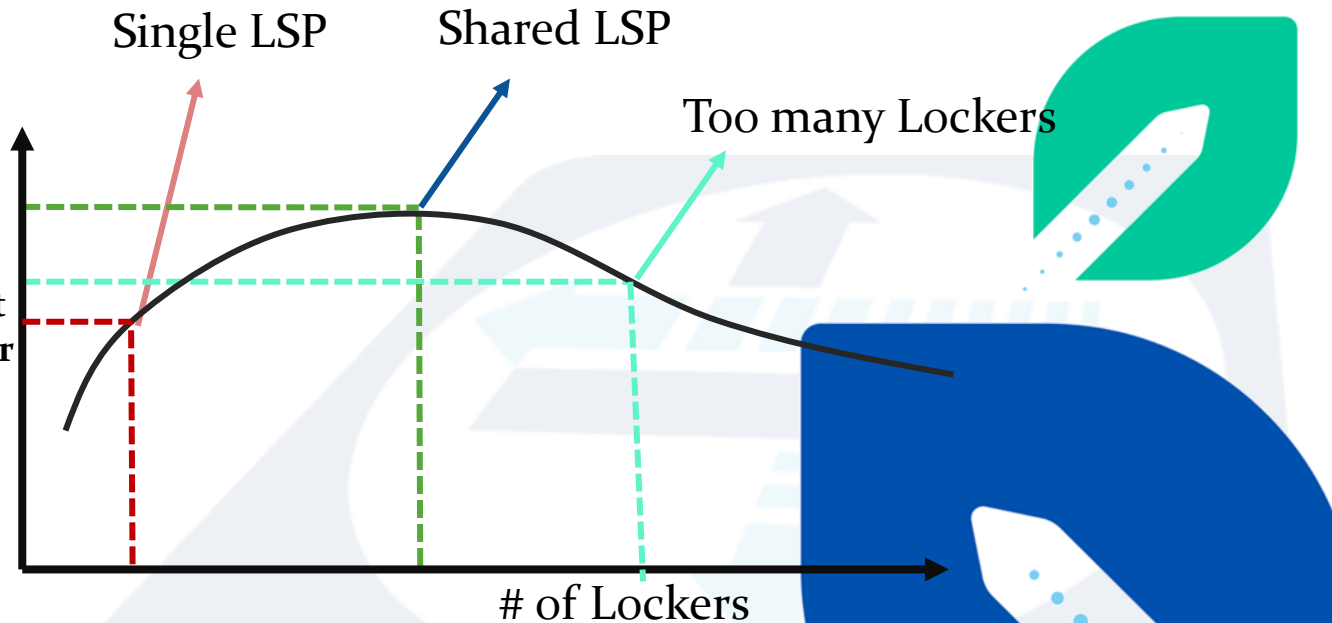
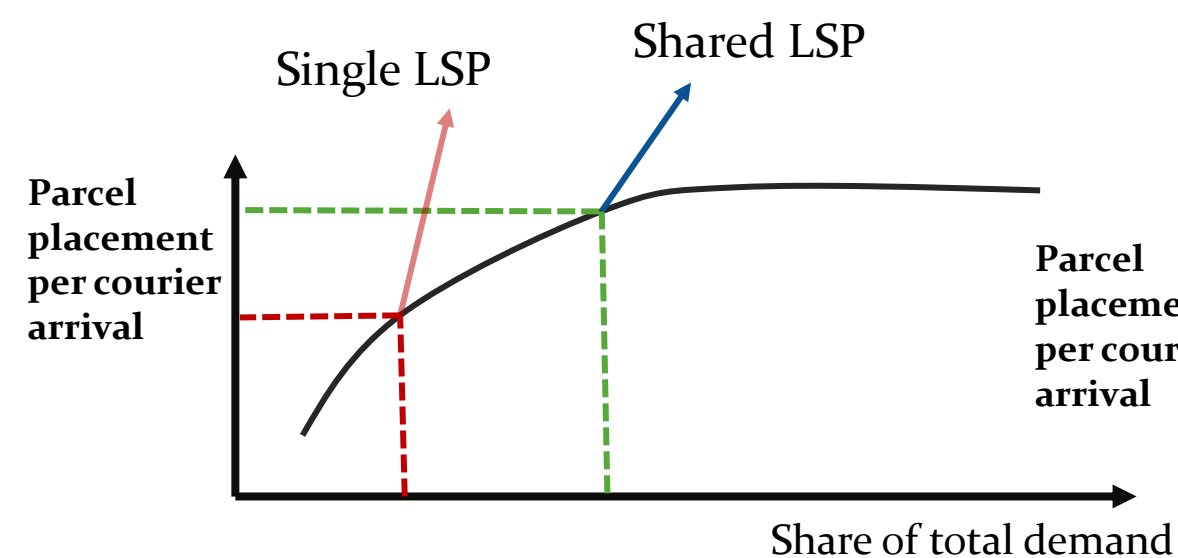




Important System Parameters



Parcel placement per courier arrival → *Number of orders placed by a single visit*



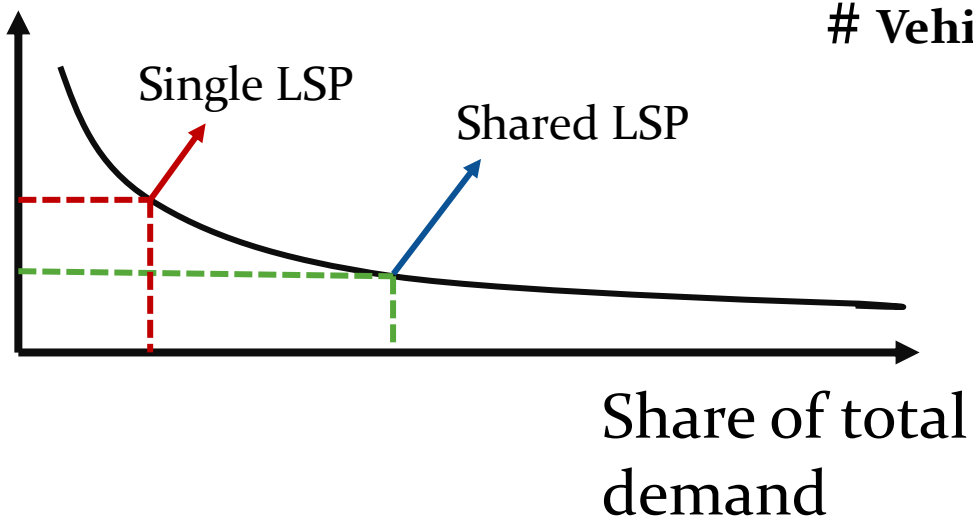


Important System Parameters

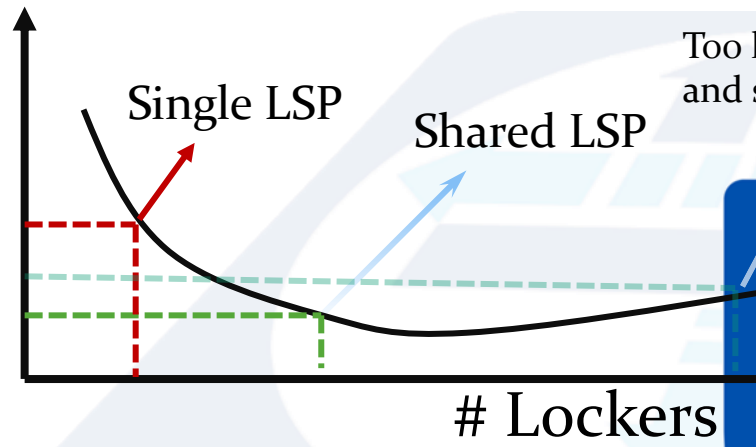


Vehicles per day operate the network → *How many vehicles (and drivers) needed to fulfil the hubs*

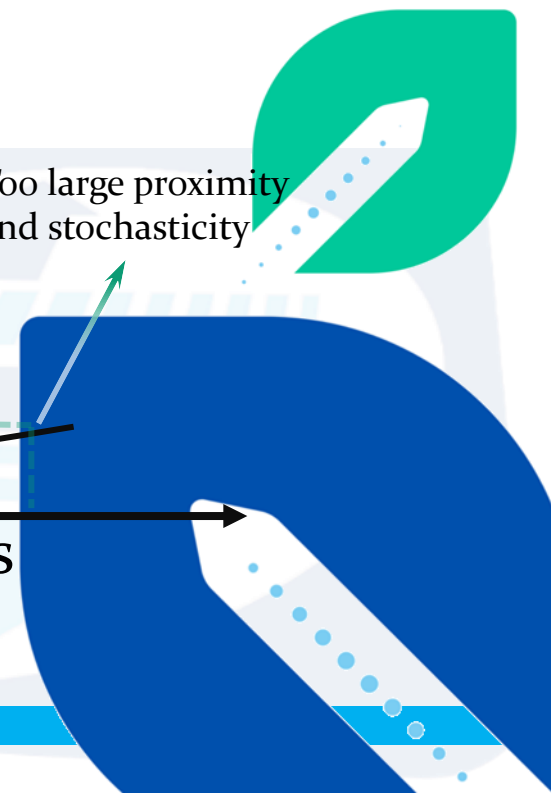
Vehicles



Vehicles



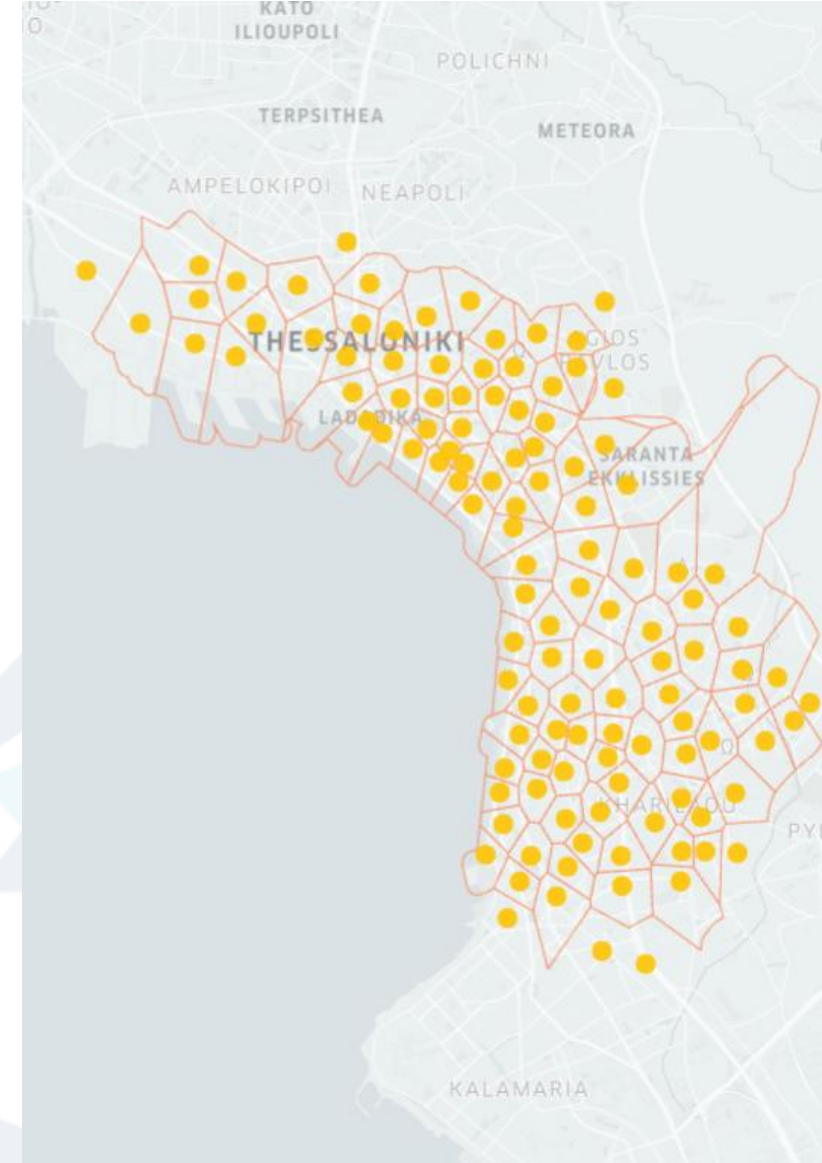
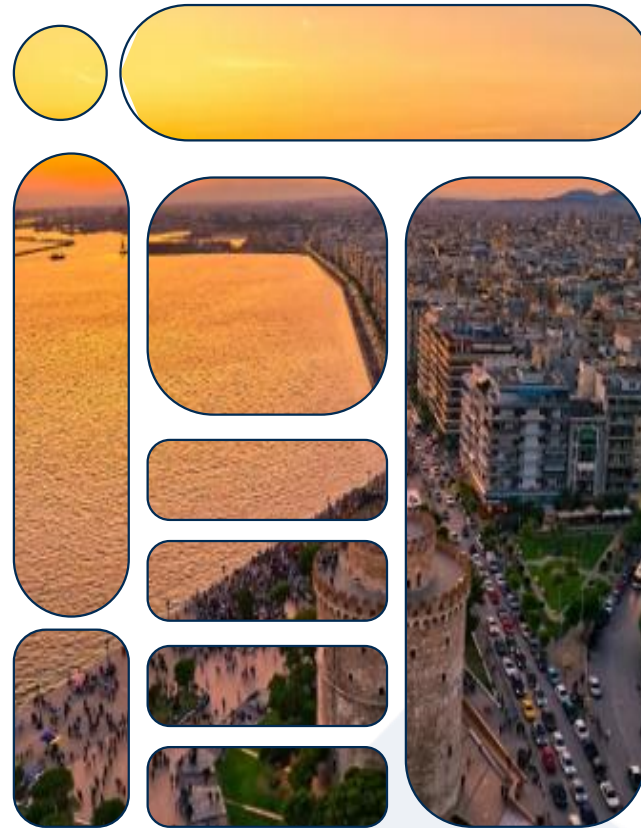
Too large proximity and stochasticity

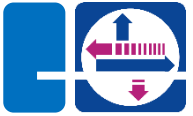




City of Thessaloniki

- ~8.500 parcels per day
- 6-8 companies perform last mile
- 320.000 inhabitants on 19.3 km²
- ~2.5% of population receives a parcel daily
- If 120 Lockers shared with 32 units each one we can have up to 45% of the demand served by locker
 - Assuming that one parcel stays ~one day on the locker
 - Assuming there is a centric 'brain' to coordinate the urban logistics operations and the lockers are accessible from all the companies





Conclusions

- Design of micro-hubs involves complex dynamics and trade-offs that emerge for strong mathematical formulations and analysis
- Consolidation, cooperation and sharing of resources is critical to amplify the impact on all sustainability levels
- Smart utilization of unused public and private space is vital
- Understanding the behavior and involving final customer on operations is mandatory to achieve noticeable results
- Visibility, Trustworthiness on data sharing under common data formats helps to accelerate the innovation and integration of multiple stakeholders





Thank You!

Questions ?



Zisis Maleas

Research Associate at Hellenic Institute of Transport – HIT
Centre of Research & Technology Hellas – CERTH
zisismaleas@certh.gr

