Urban Parcel Logistics Hub and Network Design: The Impact of Modularity and Hyperconnectivity

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Research Overview

Challenge: The parcel logistics industry is under pressure to meet the worldwide challenges to efficiently and sustainably offer faster and more precise pickups and deliveries across the world’s urban megacities.

Goal: Conceptual enabling of a new generation of highly meshed urban parcel logistic networks of interconnected open hubs, breaking away from the currently dominating hub-and-spoke network topology, supporting live consolidation and routing for fast, precise, and cost efficient service.

Methodology: Applying modularity & hyperconnectivity concepts underpinning the Physical Internet in designing urban parcel logistic hub networks & operations.

Multi-tier Urban Pixelization

Smart Dynamic Hub-based Parcel Routing and Consolidation

Principles:
- Implement hub-based sorting and consolidation so as to be easy, cheap, fast, reliable and safe.
- Consider options for relay-based consolidation of parcels up to hub along their planned route from source to destination.
- Smartly decide upon consolidation actions at each hub at each arrival of parcels, exploiting all current information on parcel status, consolidation options, and expected parcel demand.

Hyperconnected Hubs with Modular Containerization & Consolidation

Modular Containerization:
- Ultimately: Physical Internet Packs, Boxes and Pods
- Short term:
  - As-is: packaged parcels as packs
  - Boxes: Tote & Pallet/cage-size modular containers
  - Adapted handling carts, racks, devices, robots, and vehicles

Multi-plane Urban Parcel Logistics Web

Future Work

- Design and operation of modular-container & consolidation hubs
- Assess, instrument and pilot testing the proposed concepts
- Extend conceptual framework beyond urban and parcel contexts

Acknowledgments

Georgia Tech’s Coca-Cola Chair in Material Handling & Distribution, Georgia Tech’s Physical Internet Center and SF Technology: thanks for supporting this research.

2018 International Material Handling Research Colloquium
Savannah, Georgia USA, July 23-26, 2018