

Urban Freight in Future Mobility

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1 Motivation

- 1. City logistics/urban freight:**
 - a "grey" area for policy and governance
 - perception of inefficient operations
- 2. State of the art/practice:**
 - absence of effective simulation models and decision support systems
 - scarcity of data to understand phenomena and for model estimation/calibration
 - need for next-generation urban freight solutions
 - need for models capable of interacting with agents on the passenger system side

2 Objectives and General Approach

- 1. Improved knowledge and understanding of urban freight flows**
 - Leverage on the success of Future Mobility Survey (FMS) tools to develop next-generation, sensing-based (GPS, RFID, OBD, etc.) and scalable data collection capabilities
 - Quantify freight flows and understand city logistics operations in Singapore and US
- 2. Develop a system-wide decision support system for urban freight**
 - develop innovative modelling approaches and tools for urban freight stakeholders
 - integrate agent-based passenger models in the long-, mid- and short-term decisions
- 3. Freight-friendly policy-making and next-generation city logistics**
 - design/test "freight-friendly" policy-making in Singapore and elsewhere
 - design, appraise and operate next-generation technologies
 - understand the impacts of transport and land-use planning choices



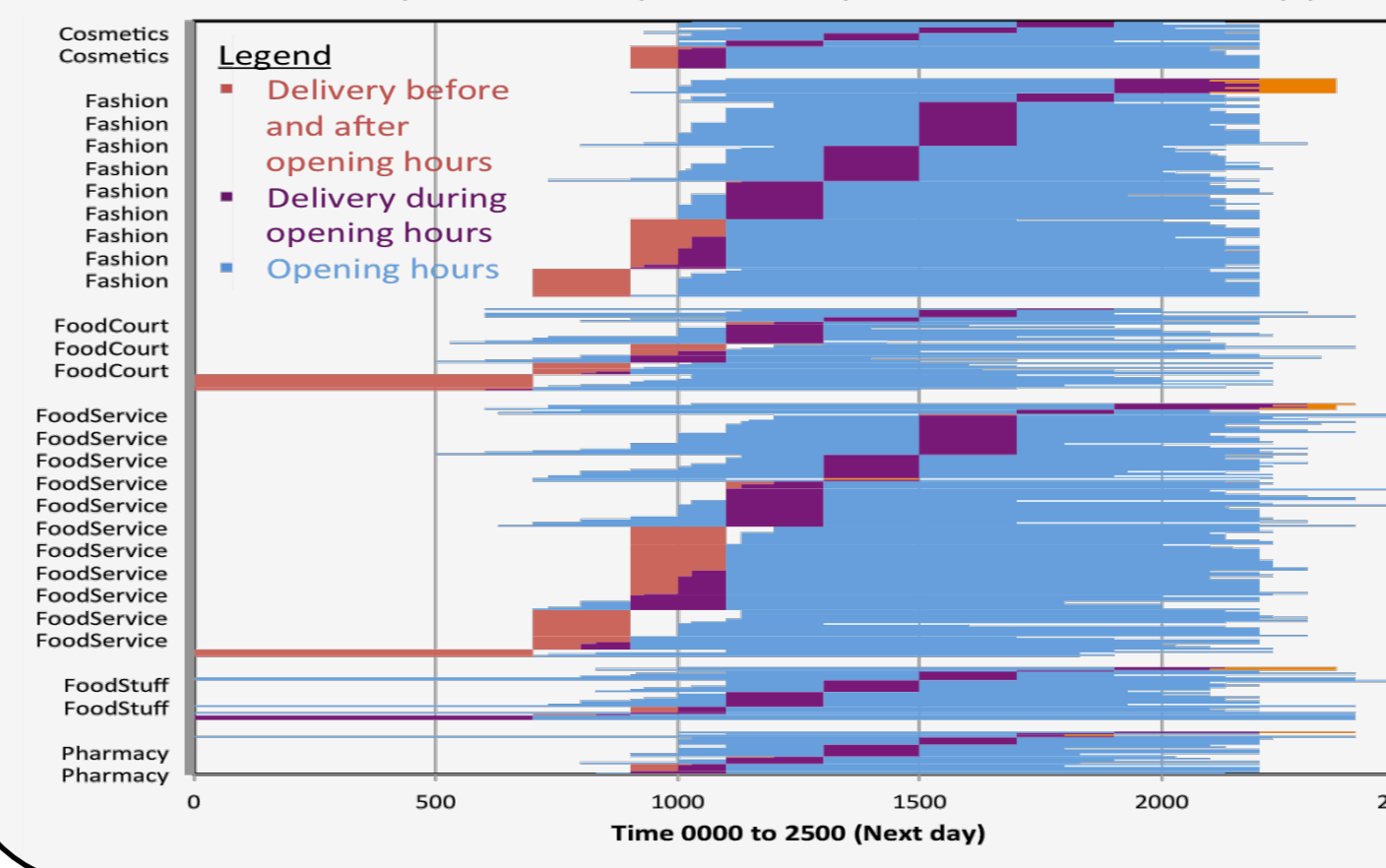
3 Data Collection (cont'd)

Retailer Survey and Loading/Unloading Bay Observations

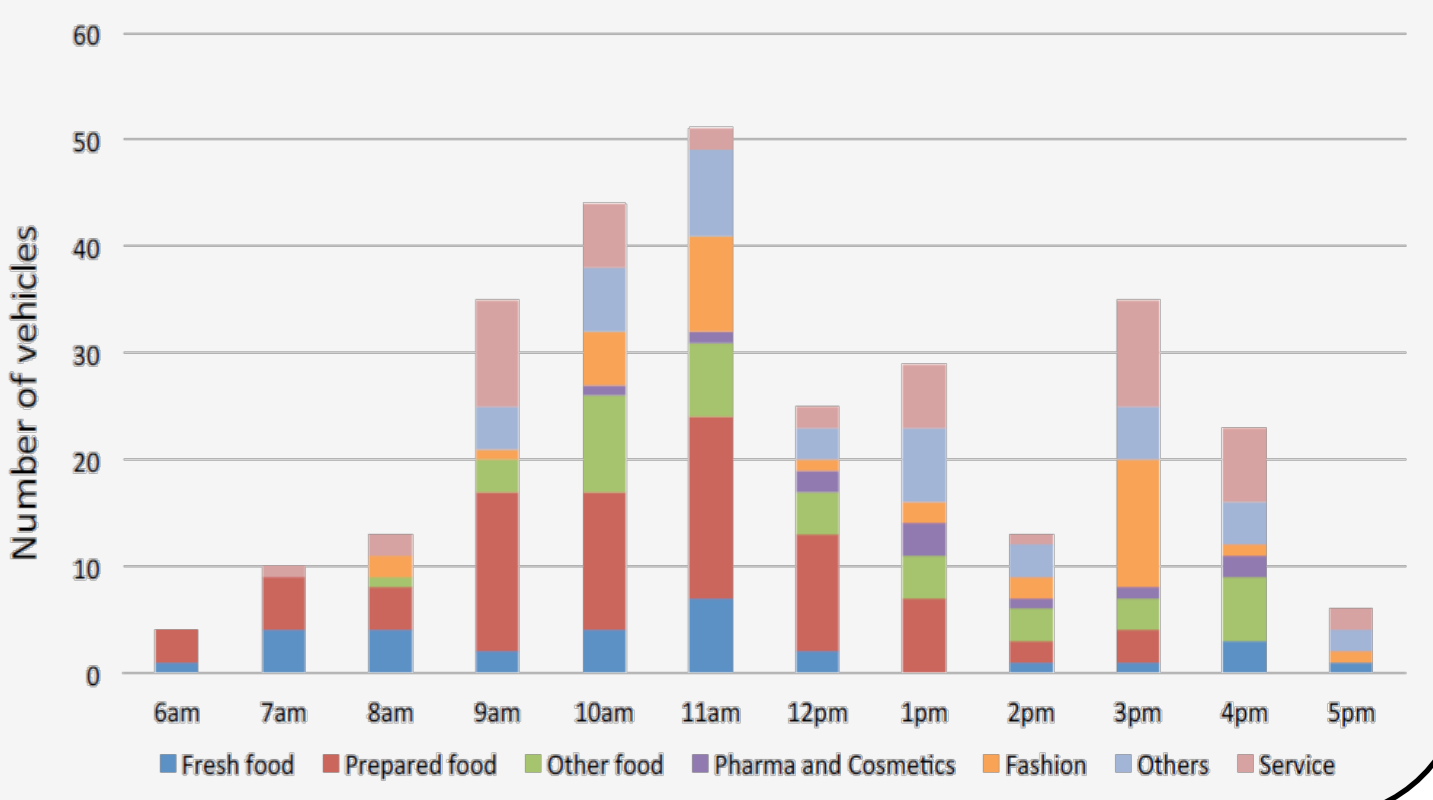
Objectives: understand the transportation needs of retailers by conducting tablet-based/paper-based surveys

Purpose: evaluate factors that influence retailers' logistics decisions (shipment size, restocking frequency and time, choice of suppliers) to develop behavioural models for agents in SimMobility

Retailer Survey: Delivery time by establishment type



Loading/unloading observations (Hourly arrivals by type of commodity at Bugis Junction on April 2014)



4 Modelling

Long-term Objective: modelling long-term freight and logistics choices

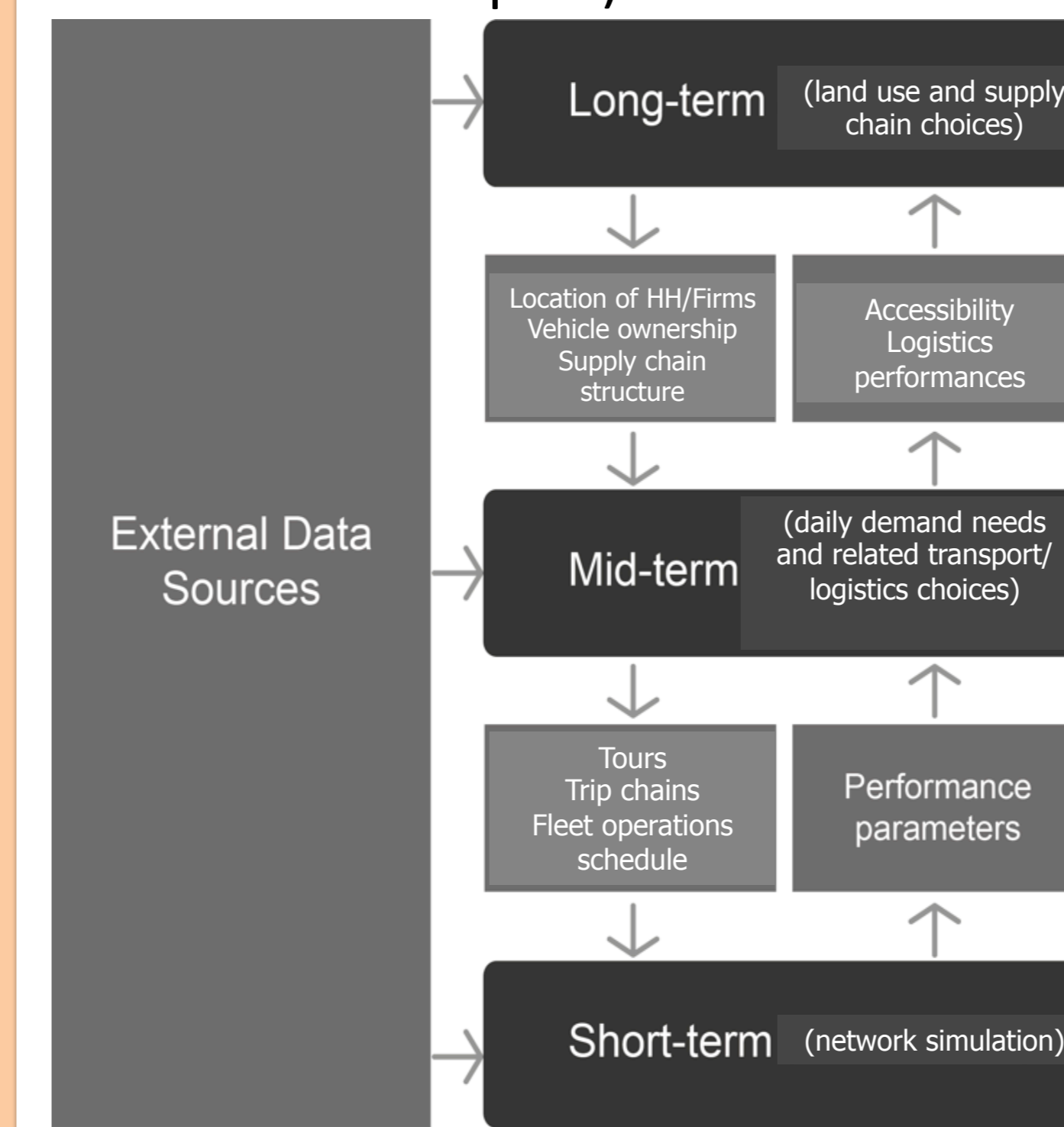
- Long-term choices to be modelled:**
- (re)location model for service sector
 - labour force
 - supply chain structure (for producers/suppliers)
 - vehicle fleet ownership (for carriers and own transport)

Mid-term Objective: modelling demand-driven pre-day and within-day logistics and transport decisions/ interactions of all agents

- Logistics choices:**
- frequency/volume of restocking by commodity
 - pickup/delivery time windows
 - choice of suppliers
 - within-day re-arrangement of shipment plans
- Transport choices:**
- choice of transport provider
 - type of vehicle to use, choice of tour type
 - within-day re-routing

Short-term Objective: network microsimulation of freight vehicle movements, logistics and passenger transport systems:

- coupled with impact assessment models (e.g. emissions)
- performance measurement of individual and fleet delivery services
- modelling parking choice and freight operations impacts on passenger movements



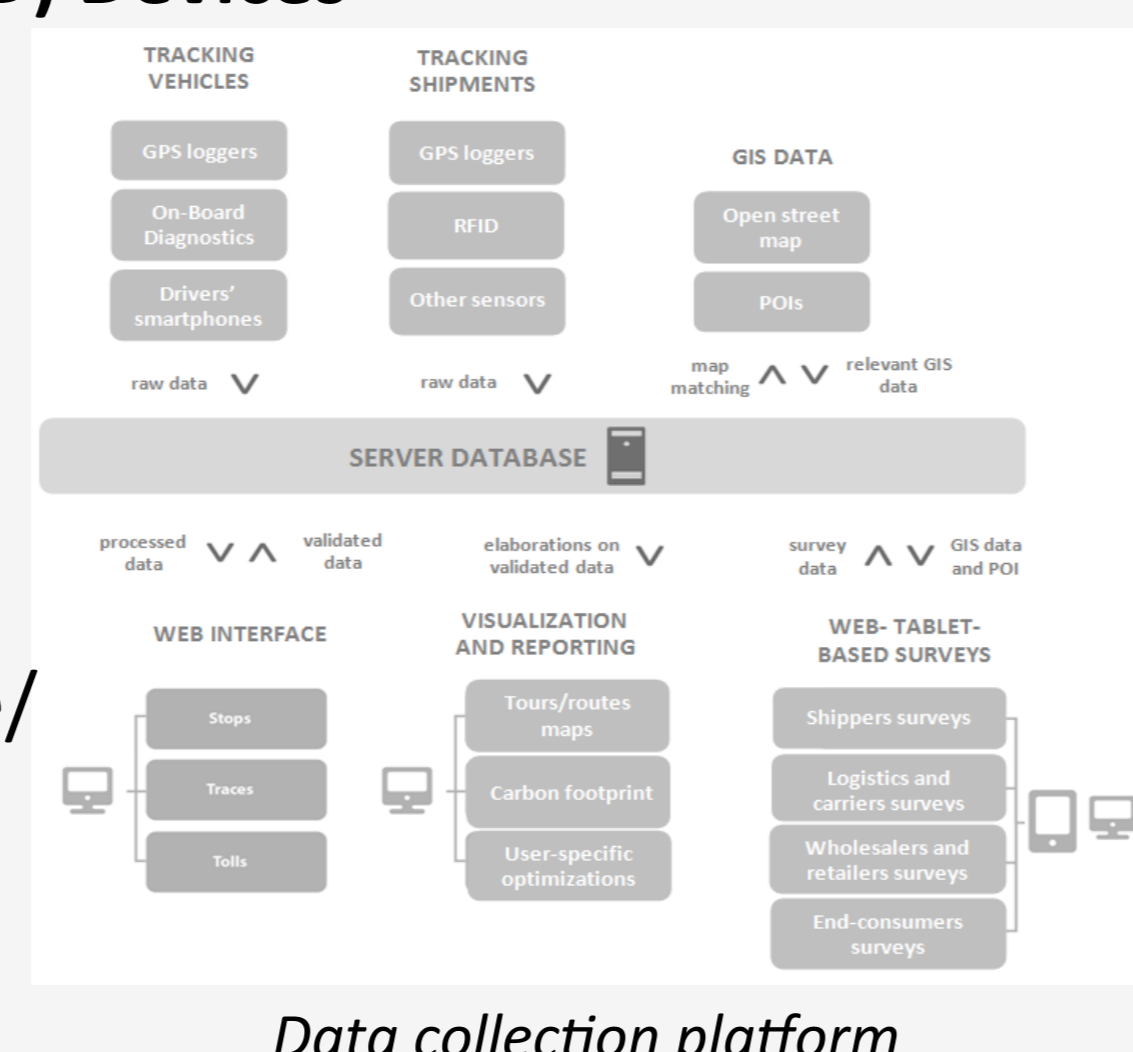
3 Data Collection

Commercial Vehicles' Survey (FMS Concept) and GPS/On-board Diagnostic (OBD) Devices

Objectives:

- collects previously unobtainable data of truck movement and trip purposes using web-/tablet-based methods

- Purpose:**
- evaluate factors that influence drivers' route choice/trip decisions and develop behavioural models for agents in SimMobility
 - to monitor the performance of the truck fleet easily by logistics operators
 - to monitor emissions of trucks operating in Singapore by Government Agencies



Data collection platform



Single trip data sample: 10/10/2014

Travelling speed profile

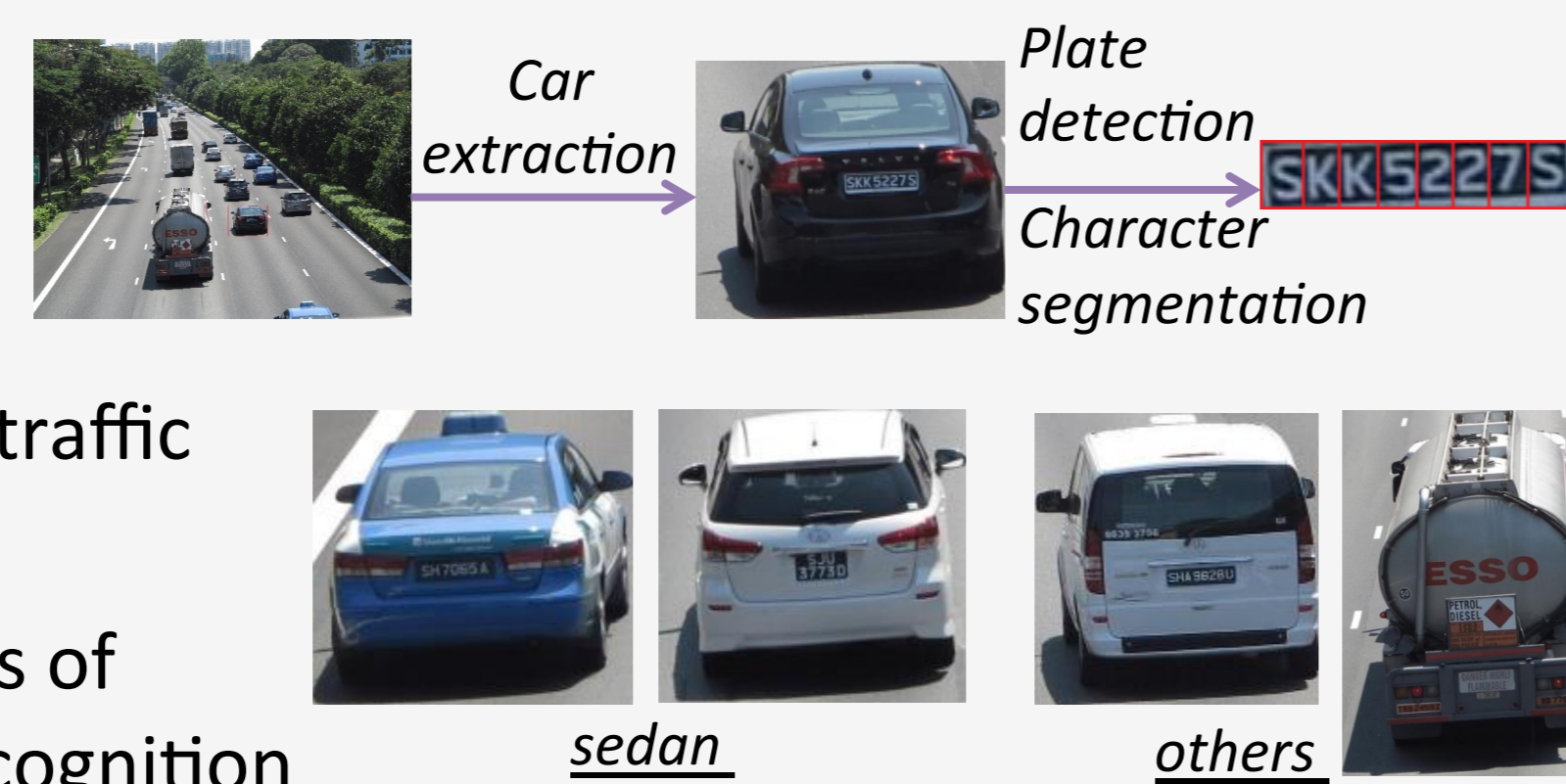
Instantaneous fuel consumption

Counting freight traffic using image processing

Objectives: conduct feasibility study to count and classify vehicles from camera videos/ images with state-of-the-art algorithms

Purpose: future adoption in conducting traffic counts for model estimation/calibration

Approaches: Matching extracted images of vehicle by shape/size or license plate recognition with images in a preset large database

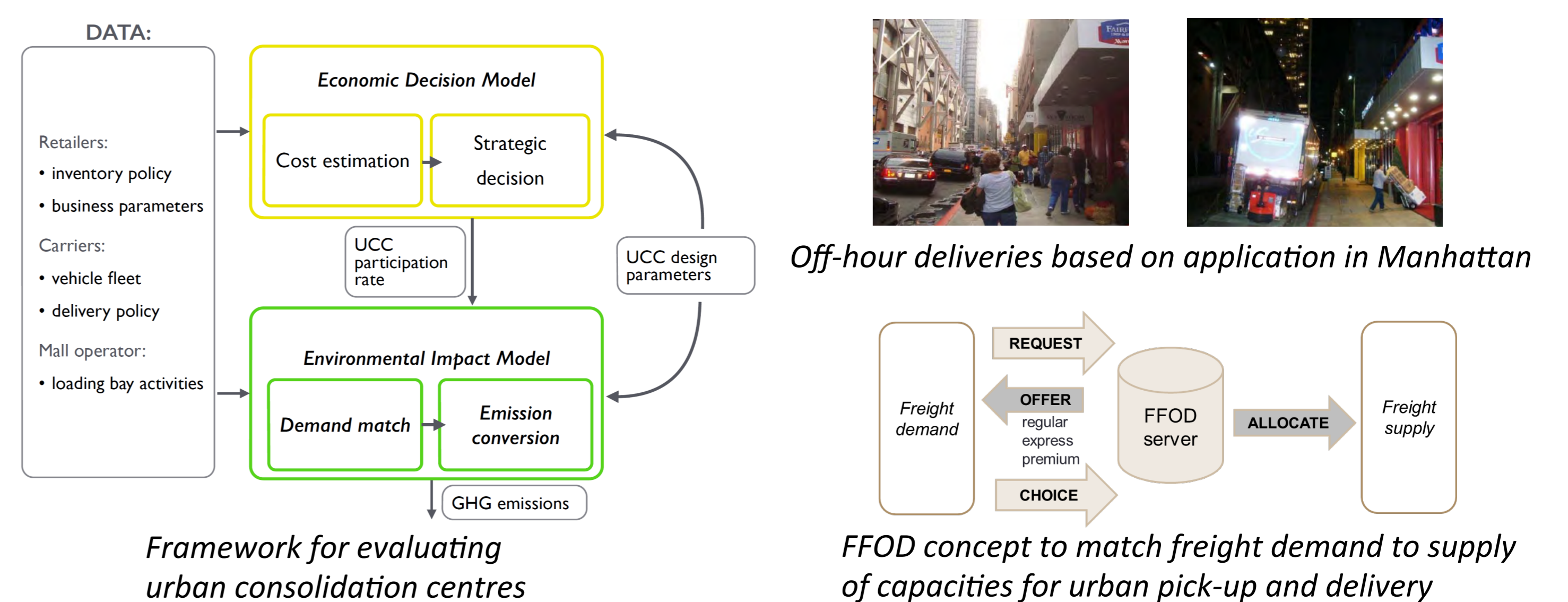


* Classification accuracy (two classes): 94%

5 Solutions

Applications of SimMobility for Urban Freight

- To evaluate policies for
 - Urban developments (highway expansions, population growth)
 - Transportation (distance-based ERP, heavy vehicle parking, etc.)
 - Urban freight solutions (urban consolidation centres, off-peak deliveries)
- Technological support for
 - Autonomous vehicles for freight
 - V2X and V2V dedicated to freight
 - Flexible freight-on-demand services (FFOD) and real-time collaborative logistics



Framework for evaluating urban consolidation centres

FFOD concept to match freight demand to supply of capacities for urban pick-up and delivery

Partner Agencies and Organizations:

