

*Europe in my region/city:*

# **A urban consolidation center for L'Hospitalet de Llobregat**

**Plans de millora de la qualitat de l'aire. Mesures i experiències**

## **Centre d'Innovació del Transport, CENIT**

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*Barcelona, 31 d'Octubre de 2013*



**Ajuntament de L'Hospitalet**

## Freight distribution in European cities

-Significant mileage and pollution associated to the freight transport sector in cities.  
Barcelona (2008):

- 18% of the total distance travelled
- 36.9% of the total amount of CO<sub>2</sub> produced by transport sector.

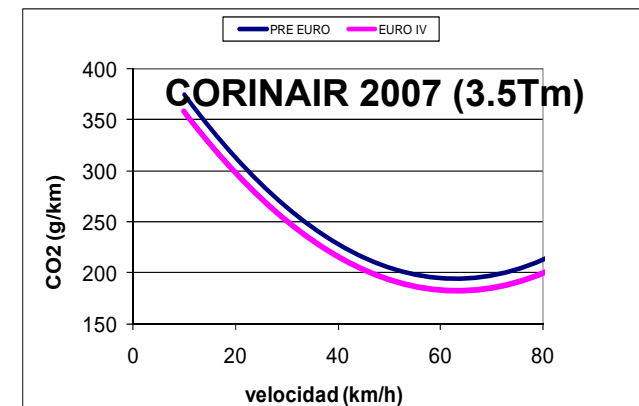
-Cities are continuously congested and not prepared for handling freight shipments  
Passenger VS. freight network planning and operation →  
Regulations, coercitive measures....

-Freight distribution: it is a need for maintaining the economic activity of the city...  
but it really bothers several stakeholders

Emissions caused by the Distribution fleet:

$$E(v) = \sum FE(v)_{(i,j)} \cdot \text{veh-km}_{(i,j)}$$

**TREND?**



## Outline

L'Hospitalet de Llobregat

Demo Concept

Demo Design

Demo Studies

Demo Results

Previous Conclusions

## L'Hospitalet de Llobregat (I)

- **L'Hospitalet suffers from the common problems of urban distribution**

- ♦ High operation costs and delays in last-mile delivery
- ♦ Commercial opening hours tightens distribution network affecting punctuality and reliability
- ♦ High number of commercial vehicles entering the city, congestion and indirect effects. In emissions, at the maximum limit (ICAEN, 2010)
- ♦ Illegal parking in unloading.

### Energy Consumption and CO<sub>2</sub> Equivalents

|                  | kWh        | Tn CO <sub>2</sub> Eq |
|------------------|------------|-----------------------|
| Industrial       | 15%        | 15%                   |
| Tertiary         | 17%        | 22%                   |
| Public Services  | 2%         | 2%                    |
| <b>Transport</b> | <b>41%</b> | <b>35%</b>            |
| Housing          | 26%        | 25%                   |



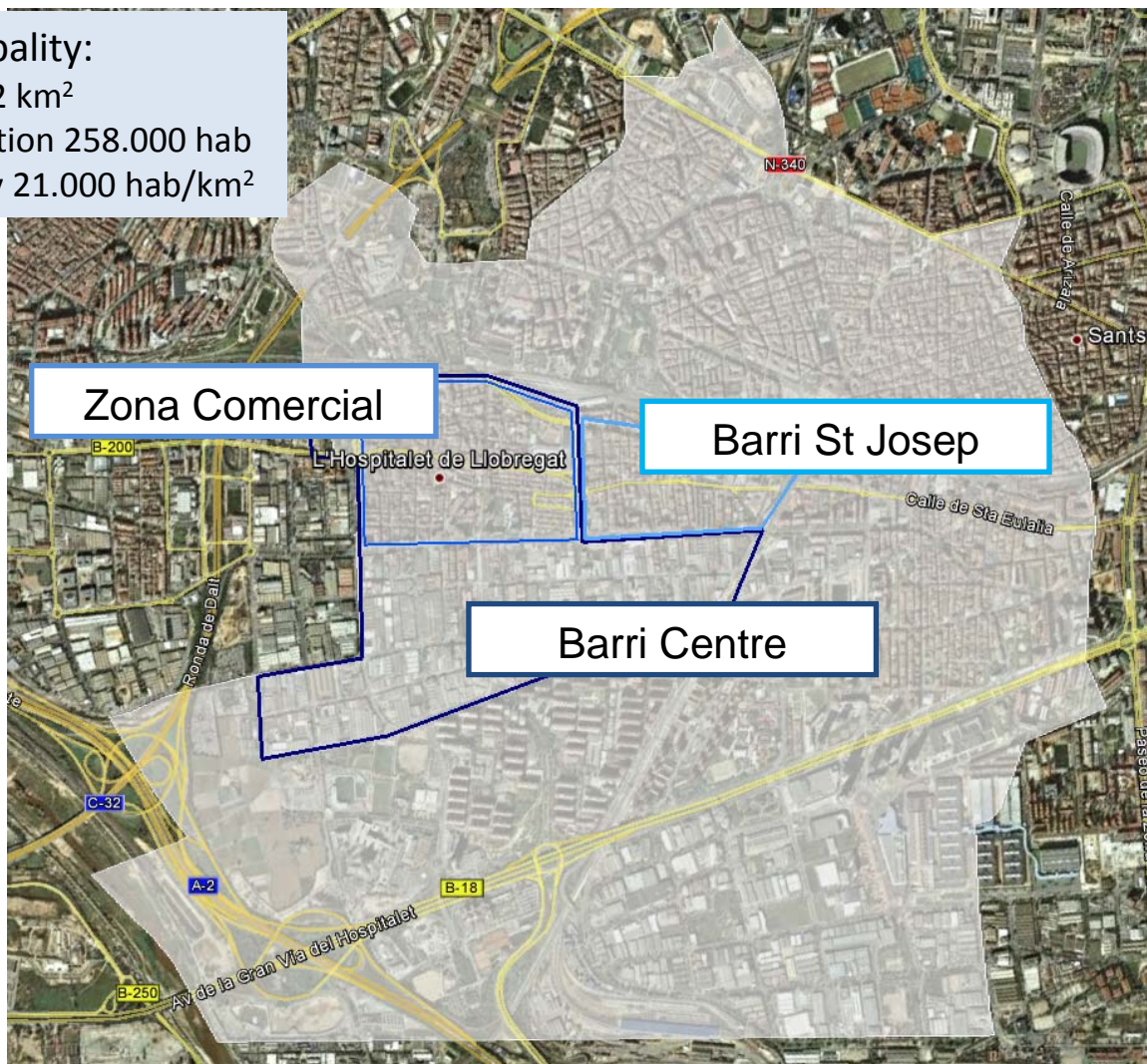
### Annual movements of goods

|                              | To/ From demo site | Within demo site | Total   |
|------------------------------|--------------------|------------------|---------|
| 1000 vehicle kilometres      | 618,781            | 148,101          | 766,882 |
| 1000 truck movements (trips) | 553                | 224              | 777     |
| 1000 passenger km            | 599,698            | 120,136          | 719,834 |
| 1000 tonne km                | 706,755            | 24,798           | 731,554 |

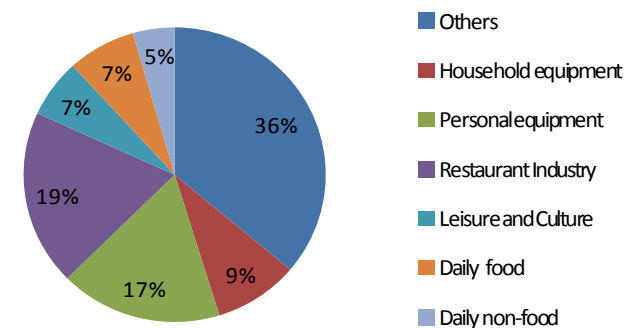
## L'Hospitalet de Llobregat (II)

### Municipality:

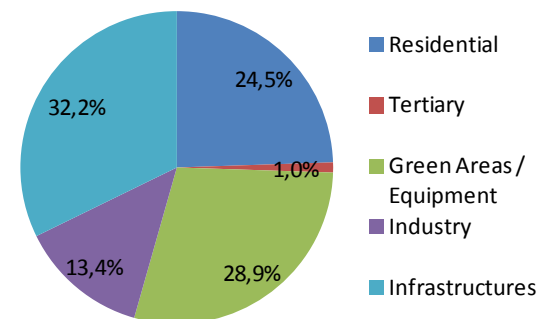
- Area 12 km<sup>2</sup>
- Population 258.000 hab
- Density 21.000 hab/km<sup>2</sup>



### Stores by type:



### Land uses:

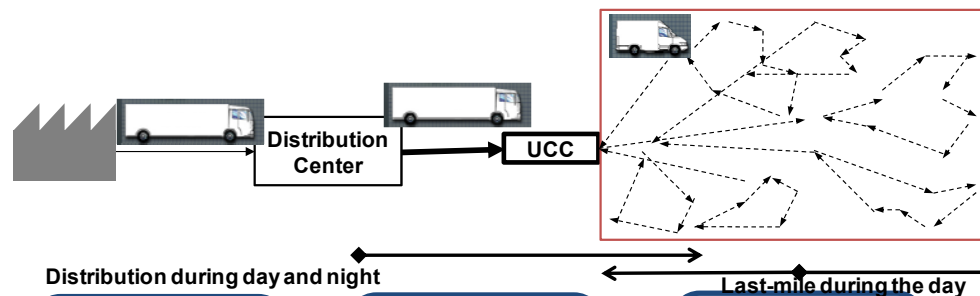
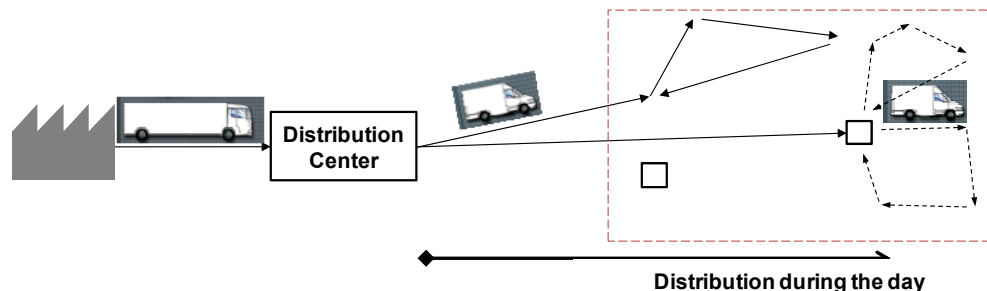


## Demonstration Concept. Basic Idea

“Consolidate flows in terminals (UCC) before urban distribution in order to improve the efficiency of last mile network”

### Operational objectives:

- ▶ Increase vehicle load factor
- ▶ Reduce the number of freight vehicles entering the area
- ▶ Maintain the level of service for retailers



### Stakeholders involved:

Interurban Carrier  
Urban Carrier  
Other shippers

Operation of vehicles in zero emission zones

UCC manager

Optimization of terminals

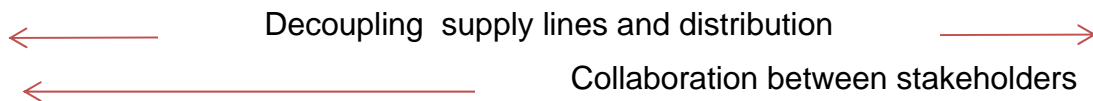
Goods Receivers

City Council

New regulatory solutions

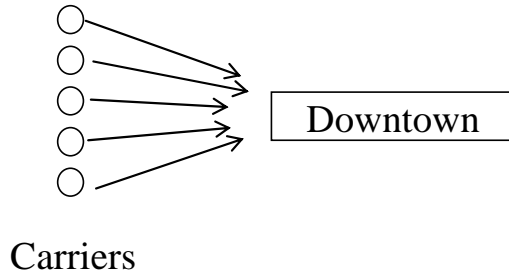
Residents

Urban Distr. to reduce impact on residents

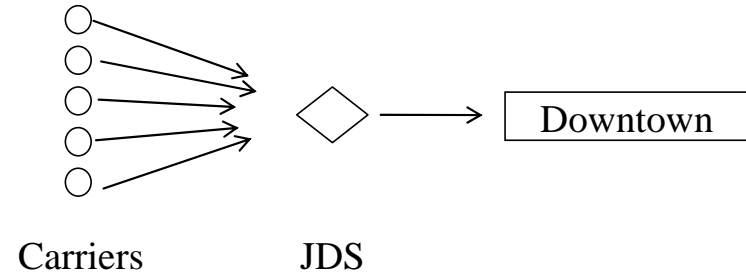


## Demonstration Concept. Past experiences (I)

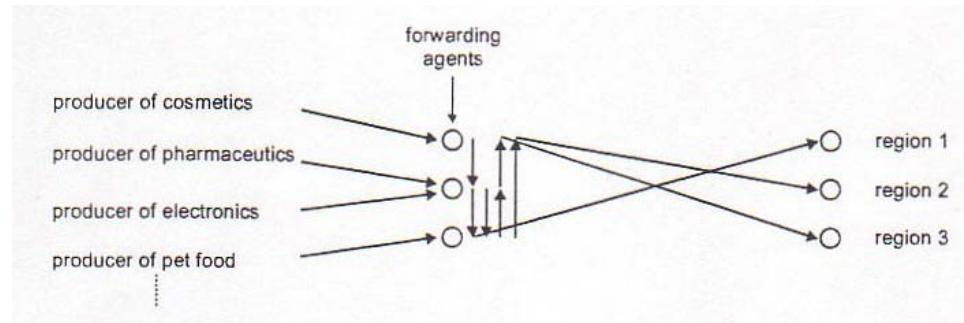
### Current Scenario:



### Proposed Solutions:



A)



B)

Kassel: -60% mileage, -13% frequency, +15 % weight/stops

Freiburg: -33% trips, -48% time

Fukuoka (Japan) since 1977: 36 companies. 100.000 shipments/month (1/3 total)

Área Metropolitana BCN: Distrust, but pharmaceutical sector does it

## Demonstration Concept. Past experiences (II)

### ▶ France. ELCIDIS La Rochelle:

- ▶ 84.000 inhabitants with difficult acces in the city center
- ▶ Municipal subsidy of 26% of the operational costs (4 €/shipment) & 40% of construction costs from EU.
- ▶ 300-400 shipments/day from 12 companies, less than 600 forecasted
- ▶ Initially (2001) municipal vehicles
- ▶ Immediate future: Operator will be responsible also for electric mini-buses, car-sharing and urban goods distribution



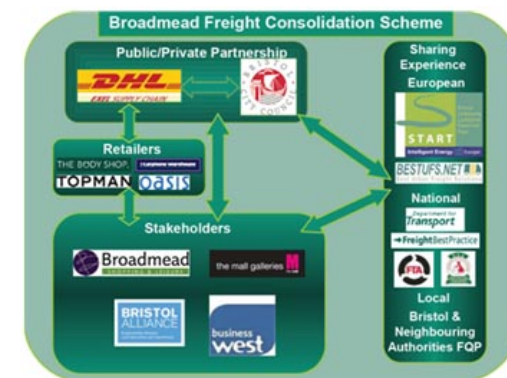
### ▶ Monaco:

- ▶ Municipal subsidy of 21% of costs (4€/shipment)
- ▶ Concession to a one private company



### ▶ DHL Experiences:

- ▶ **Bristol.** Public-private partnership. 604m<sup>2</sup>, located at 16km from the city center. 72% trip reduction.
- ▶ **Heathrow Airport.** 40% of retailers participating, potential savings in both supply chain and staff costs





## Demonstration Concept. Critical points of past experiences

### Critical Points



Coercitive measures



Financial Issues

Lack of Demand  
Consolidation



### Proposed Alternatives



Collaborative solutions



Private-Public Partnership

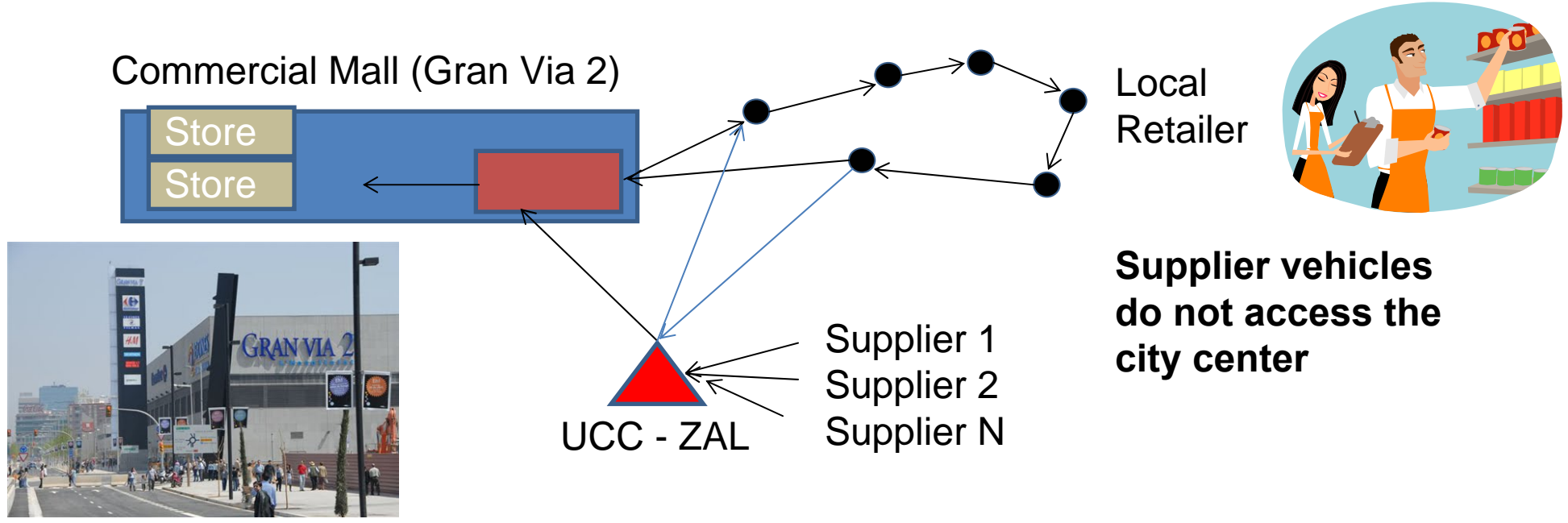


Business model solution

Hybrid Concept UCC 

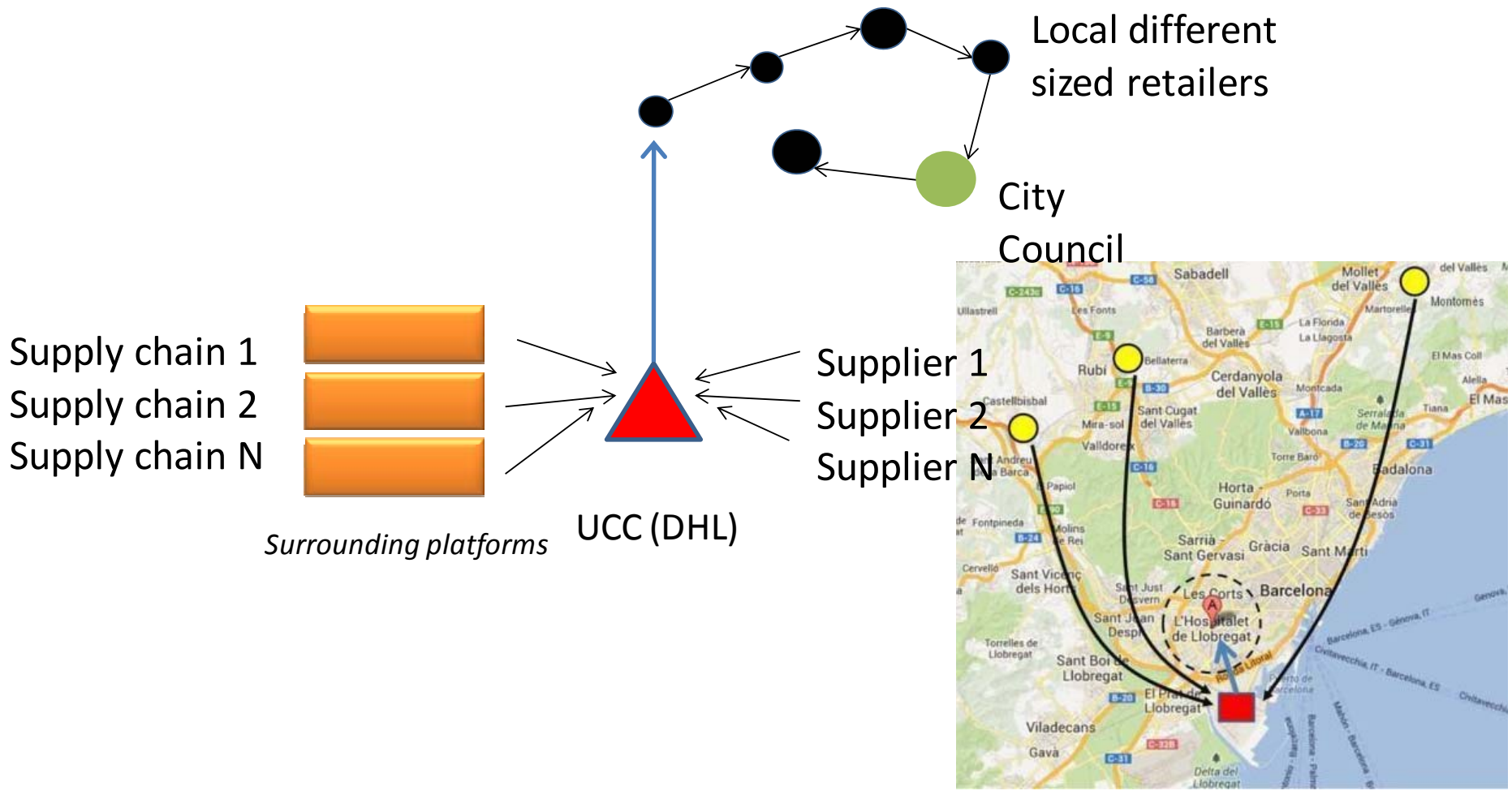
## Demonstration Concept. Hybrid Concept

### Hybrid Concept UCC. Big demand Attractor



## Demonstration Concept. Hybrid Concept (II)

### Hybrid Concept UCC. Multiple Supply Chains Managed Individually



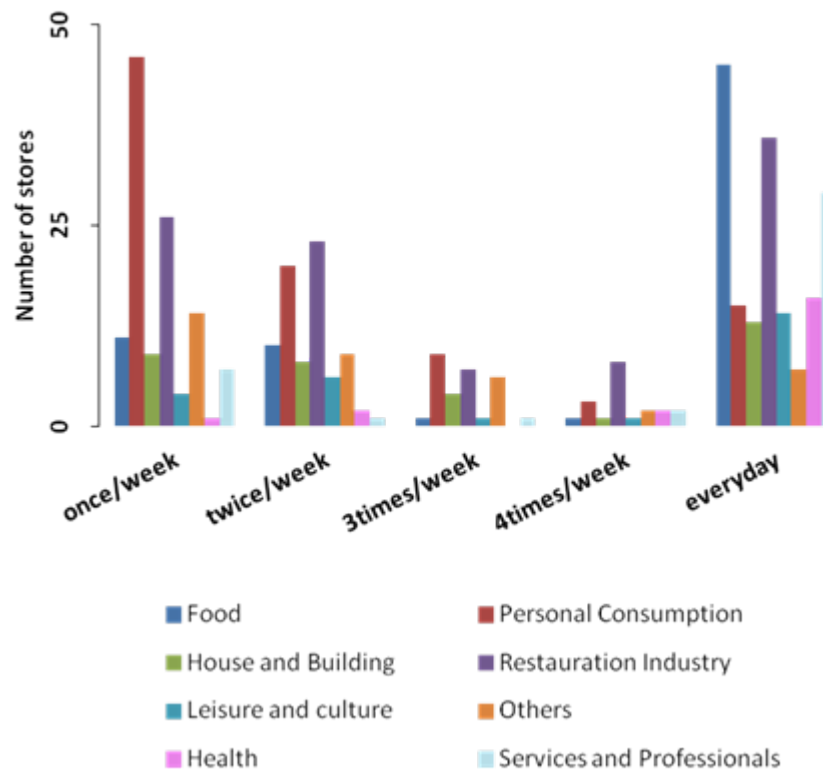
## Demonstration Design. Diagnosis

Retail's survey (Jan-Feb'12). 504 stores

- ♦ General Common Questions. Shop features
- ♦ Types of shipment reception
- ♦ Features of the shipment
  - » Frequency, dimensions, volume/weight, preferences
- ♦ Other issues or suggestions



### Reception frequency per store type

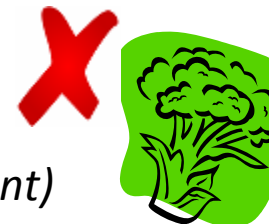


Food & Restauration → everyday  
 Personal & House → Once/twice

## Demonstration Design. Enrolment of stores

- Enrolment of stores

- ▷ Selection of potential stores
- ▷ Interviews small retailers 70 (10 signed the agreement)
- ▷ Involvement of Gran Via 2 (Carrefour)
- ▷ Last action: Some DHL customers consolidation



- Benefits/motivation

- ▷ Advertisement in local media
- ▷ Sticker environment responsibility
- ▷ Social responsibility



- Performance

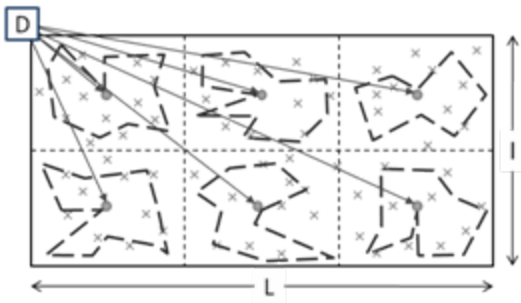
- ▷ Retailers sign a **collaboration agreement**
- ▷ Retailers **change the delivery address to the UCC**
- ▷ DHL serves from **UCC to Gran Via 2 and local retailers**



## Demonstration Studies. LSA Methodology

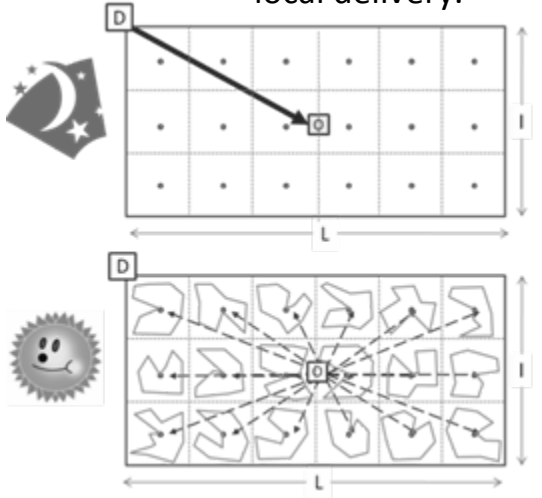
Analytic Model to approximate length, vehicle and cost savings

**Strategy A.** Each company operates independently

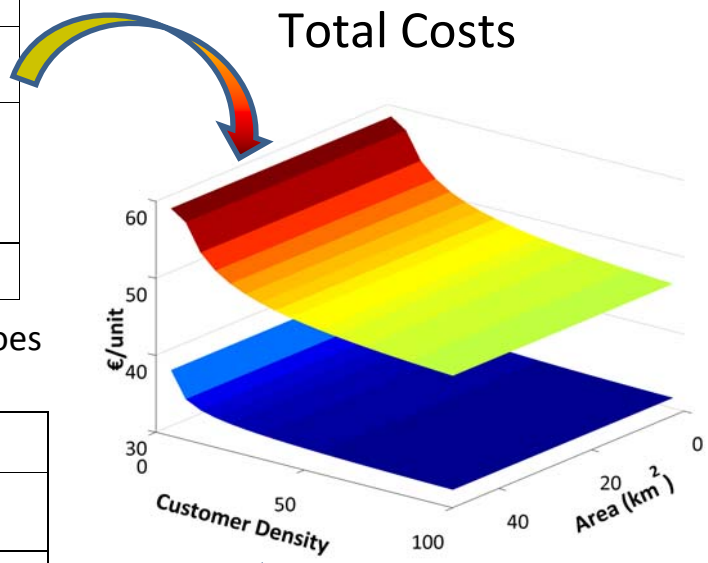


|                    |   |
|--------------------|---|
| Local distance     | $L_{local} = \frac{L^2}{3} \cdot \frac{1}{L} = \frac{L}{3}$   |
| Line-haul distance | $L_{line-haul} = \frac{2L^2}{3} - \frac{L^2}{2} \cdot \frac{1}{L} = \frac{L^2}{6}$  |
| Time               | $T = \left[ \frac{2L^2}{3} + \frac{L^2}{2} \left( \frac{1}{3} \left( \frac{1}{L} - \frac{1}{2L} \right) + \left( \frac{1}{3} \right)^{1/2} \frac{1}{L} + \frac{1}{L} \right) \right]$ |
| Cost               | $C = C_{local} \cdot L_{local} + C_{line-haul} \cdot L_{line-haul} + C_{depot}$   |

**Strategy B.** Each company brings the goods to the UCC and a neutral carrier does local delivery.



|                    |   |
|--------------------|---|
| Local distance     | $L_{local} = \frac{L^2}{3} \cdot \frac{1}{L} = \frac{L}{3}$   |
| Line-haul distance | $L_{line-haul} = \frac{2L^2}{3} \left( \frac{1}{L} + \frac{1}{L} \right) - \frac{L^2}{2} \cdot \frac{1}{L} = \frac{L^2}{3}$   |
| Time               | $T = \left[ \frac{2L^2}{3} \left( \frac{1}{L} + \frac{1}{L} \right) + \frac{1}{3} \left( \frac{1}{L} - \frac{1}{2L} \right) + \left( \frac{1}{3} \right)^{1/2} \frac{1}{L} + \frac{1}{L} \right]$ |
| Cost               | $C = C_{local} \cdot L_{local} + C_{line-haul} \cdot L_{line-haul} + C_{depot}$   |



10-14% in operating saving cost

## Demonstration Studies. UCC Location Criteria



### Location Criteria:

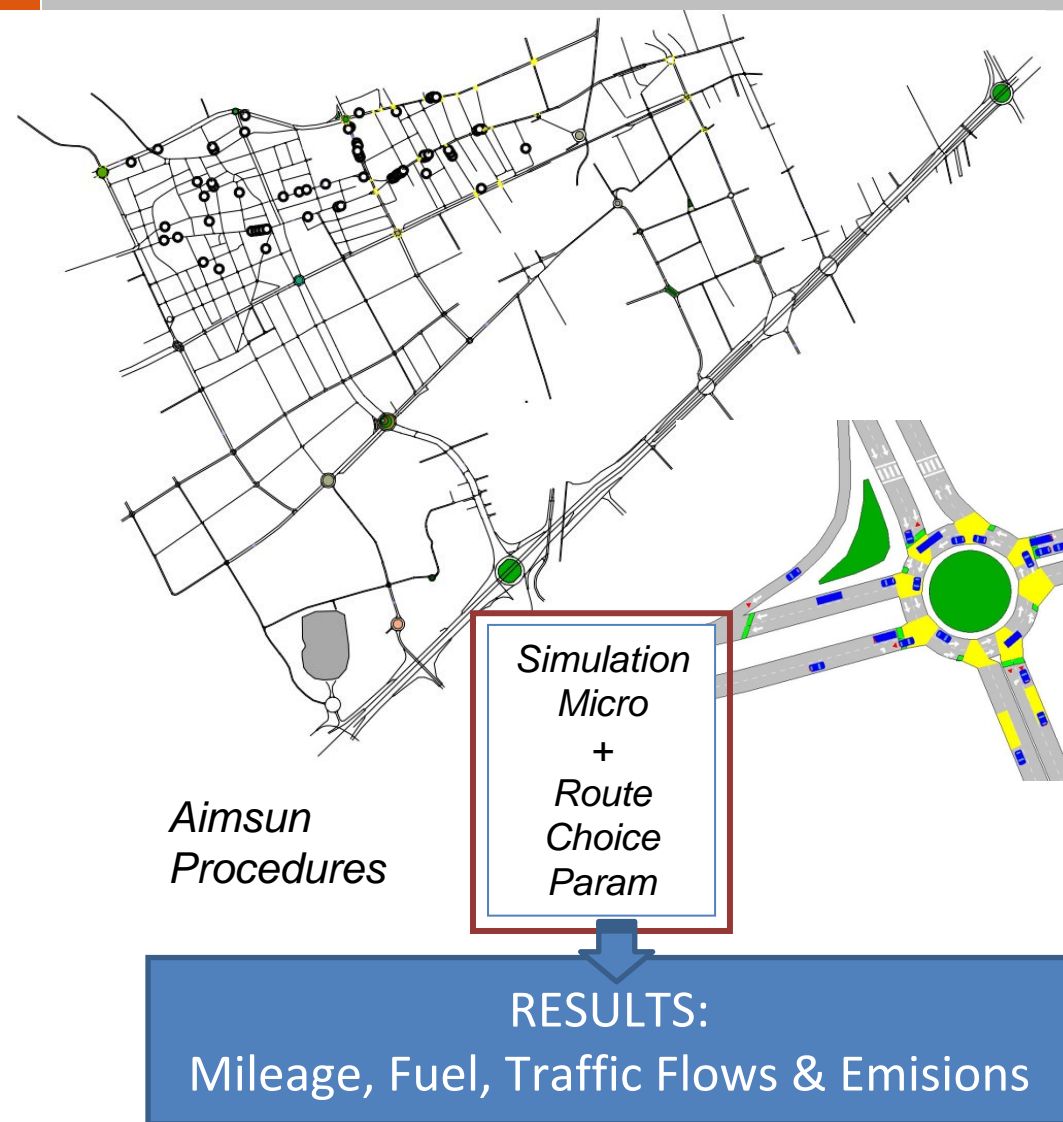
- Acces time/distance to the delivery area
- Existing equipment
- Availability of space
- Investment needed
- New potential demand

### Location Alternatives:

1. Devoted infrastructure
2. Shared infrastructure- Small mall center
3. Shared infrastructure- Big mall center
4. Owned infrastructure

| Criterion          | 1. Can Serra | 2. La Farga | 3. Gran Via 2 | ZAL  |
|--------------------|--------------|-------------|---------------|------|
| Distance           | 0.5-1.5 km   | <0.5 km     | 2.5-3.5 km    | 6 km |
| Equipments         | ✓            | ✗           | ✗             | ✓    |
| Space availability | ✓            | ✓           | ✓             | ✓    |
| Investment         | ?            | ?           | ?             | ~0   |
| New demand         | ✗            | ✓           | ✓✓            | ✓    |
| <b>Decision</b>    |              |             |               | ✓    |

## Demonstration Studies. Traffic Simulation



## Comments

- Benefits in consolidated routes are **highly positive**. (mileage, vehicles, travel time and fuel)
- However, the **impact is very small** in the total amount of the city.
- Savings in CO<sub>2</sub> are perceptible but small
- Two methodologies are compared to approximate emissions **Aimsun** (based on Luc Int Paris) and **indirect approximation** (based on unit emission factors).
- The Aimsun method should be a lot more accurate than the indirect approximation but differences are very high.



## STRAIGHTSOL Framework. MAMCA & Key Performance Indicators (KPI)

### Cost

| Cost type            | After demonstration | During demonstration   |
|----------------------|---------------------|--|
| Operating costs (€)  | € 70.132            | 52.810€ (transport)<br>+85.173€ (staff UCC)<br><u>+40.390€ (IT/Engineering)</u><br>= <b>178.373€</b> |
| Investment costs (€) | € -                 | € 14.308   |

25% in transport cost savings but staff+infrastructure are very high

### Air Quality

| Concentration  | After demonstration | During demonstration  |
|--|---------------------|---|
| NO, NO <sub>2</sub> , NO <sub>x</sub> (µg/m <sup>3</sup> ) |                     | NO avg 4,97 / max 159,74<br>NO <sub>2</sub> avg 30,38 < 40 / max 88,87<br>NO <sub>x</sub> avg 38,00 > 30 / max 313,93 |
| Ozone (µg/m <sup>3</sup> )                                 |                     | 38,08 <180  |
| PM10 (µg/m <sup>3</sup> )                                  |                     | Avg 28,1 >20<br>">50" 2 times/month (max 7/year)  |

Dates: 3/3/2013 -> 1/4/2013  
IDAEA-CSIC

No comparison information, only current situation  
Some indicators are over recommended

## STRAIGHTSOL Framework. MAMCA & Key Performance Indicators (KPI)

### Transport Operations

| Cost type        | Before demonstration | During demonstration                   |
|------------------|----------------------|--|
| Km truck         | ~ 2.366km/veh-month  | 1.773 km/veh-month                     |
| Km Van           | ~ 1.320km/veh-month  | 990 km/veh-month                       |
| Avg Vehicles     |                      | 3,08<br>(1,93 trucks 1,15 vans)        |
| Load Factor      | 68%                  | 73%                                    |
| Total Deliveries | 677                  | 727                                    |
| Travel time      |                      | 4h 30min/veh-day                       |
| Fuel consumption |                      | 8 l/100 km (van)<br>12 l/100km (truck) |

- **Reduction in mileage** is proportional to the transport cost 25%
- **Load Factor** during pilot test is **5% higher**
- In deliveries a 7% more during pilot test, but not perceived changes in weight

### Customer Satisfaction

- The **customer with more shipments** is **highly satisfied** with the service, **but there is a delay** of one. It is acceptable if it is not urgent deliveries
- Other customers with few or no shipments are **not satisfied** with the solution. Some experienced problems with their transport providers.

## Conclusions

Challenges/Things to be aware:

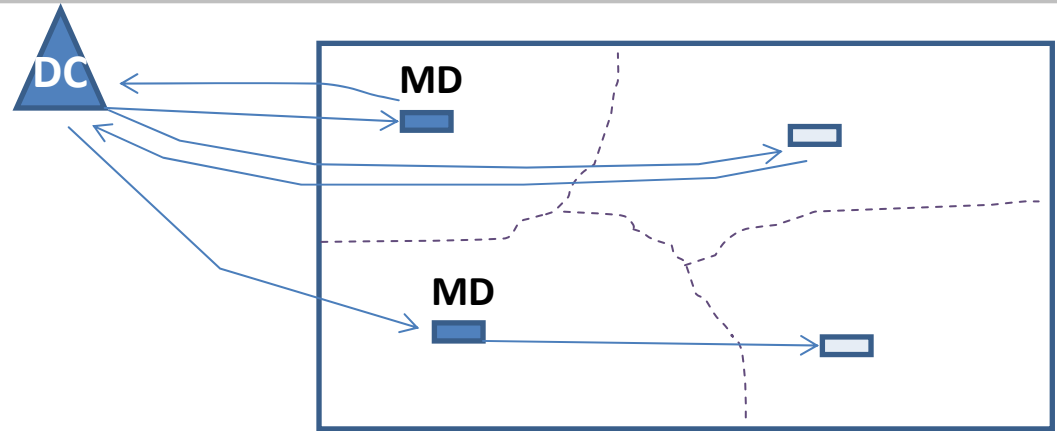
- The **leadership of a public body is essential** for improving City Logistics by means of UCC implementation.
- Effort must be focussed on **persuading 3PLs to participate and feed the UCC**, not the small shops.
- We truly believe that **more savings** can be obtained from a collection of **small retailers**, they do contribute to generate a lot of small and frequent shipments.
- **However**, small retailers are owned and run for one or two people that normally cover a lot of tasks, they **do not have time** or interest in these side problems. Indeed, the **economic crisis** has deeply affected the number of shops, and the stores business activity.
- The **combination of supply chains demand** with demand of small retailers is **promising**
- **Business model need**. The key deterrent for the development of UCC is the **high fixed costs** (infrastructure and UCC personnel).

## New versions of UCC ?

## STRAIGHTSOL Project. Mobile depot in Brussels

### Objetives of Mobile Depot

- Cost-efficiency
- Employee satisfaction
- Less emissions
- Smooth information flows
- Customer satisfaction



# SMILE Project. Transfer points & Electric Tricycles for Last Mile deliveries in Barcelona.



Features:

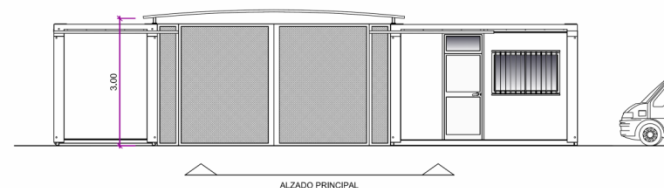
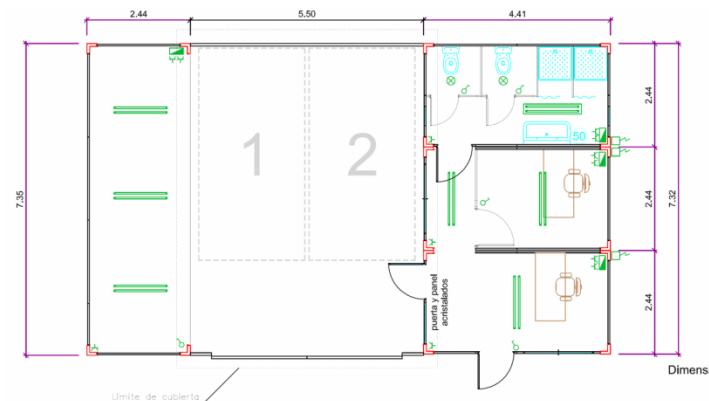


vanAPEDAL

- ▶ Pilot test in 2011 for Home Deliveries for a supermarket branch
- ▶ Currently working in different places of Barcelona: Ciutat Vella, Gràcia,...
- ▶ Access difficulties for vans and trucks, pedestrian areas, lack of un/loading areas
- ▶ TNT and SEUR are mainly working to transfer some of parcels to VANAPEDAL

## Potentialities:

- ▶ Consolidate more demand from different stakeholders:
  - ▶ Retailers
  - ▶ Transport operators mainly dedicated to long-haul
  - ▶ Provide added value services in the PICK UP
  - ▶ Service to Municipal buildings
  - ▶ Big demand attractors (hotels, big retailers,...)
- ▶ PROVIDE alternatives for access restriction
- ▶ Explore tri-cycles advertisement possibilities



# A consolidation center for L'Hospitalet de Llobregat

*Thank you!!*

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