Territorial User Interfaces ?
Different views in Smart City

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Observation préalable (1/2)

- J'étais sollicité seulement vendredi pour participer.
- Ne connaissant rien sur l'approche "Territorial User Interfaces" j'ai essayé de me documenter, mais des textes trouvés n'étaient pas convergeant
- J'attends donc la présentation luminaire (mais la présentation a été préparée avant celle-ci)

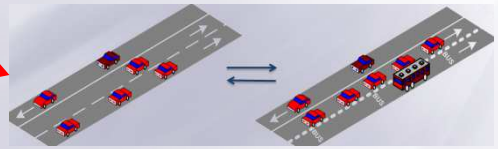
Observation préalable (2/2)

- **Territorialité géographique (comme la nôtre cas dans le Smart City) et organisationnelle**
- **Néanmoins on se retrouver sur les termes comme :**
  - Personne – groupe – data
  - Droit d'accès, de lecture, de modification
  - Duplication – Unicité des données : modèle de référence et différentes vues
- **Territorialité géographique - Ecosystème organisationnel**
- **IHM :**
  - Sur le même écran ou surface (pour différents acteurs)
  - Sur les dispositifs différents (en respectant les profiles des acteurs)

Outline

- Introduction
  - Background and Context
  - Research Method
1. Information ecosystem for eBus & eTruck
2. Bus shelter++
3. ALF project: Freight distribution based on delivery area booking
4. ADViCe: Dynamic Road Lane Management
5. Carbon free parcel distribution
6. Box-locker-based fresh items distribution: collaborative economy support

- Conclusion



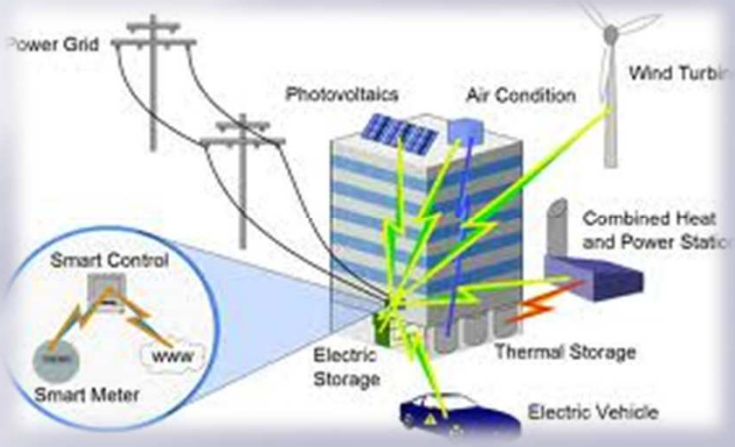
Introduction – Background & Context

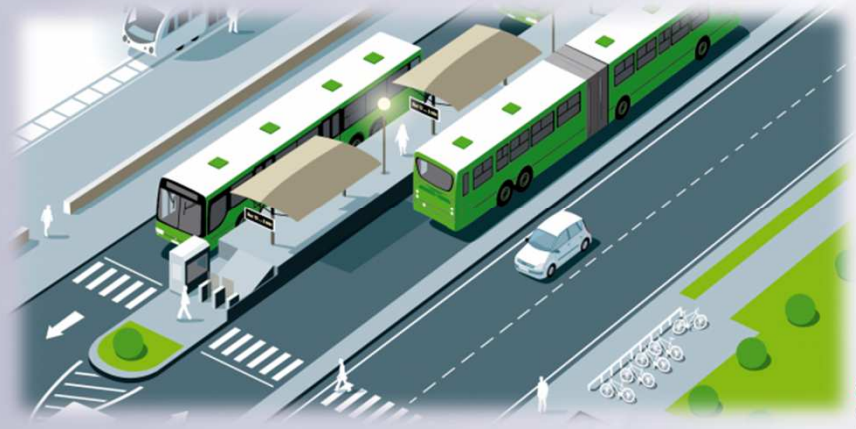
Smart City

The Concept of "Smart Cities" describe how investments in human and social capital and modern Information and Communication Technologies (ICT) infrastructure and e-services fuel sustainable growth and quality of life, enabled by a wise management of natural resources and through participative government [Caragliu et al. 2011]

- Smart via six dimensions:

  environment, economy, living, mobility, people, government
- Role of ICT, participation of citizens





Introduction – Background & Context

Our research projects and perspective

- Smart City – a real augmented environment
  - Ubiquitous Computing (**AmI** – Ambient Intelligence)
  - Up-to-date Web 2.0 & 3.0
  - Location Based Services (**LBS**)
  - Internet of Things (**IoT**)
  - User-Interfaces in Mobility, contextualization, collaboration

LBS *- services that integrate a mobile device location or position with other information so as to provide added value to a user. (Schiller and Voisard 2004)*

IoT - A full interoperability of interconnected devices, providing them with an ever higher degree of smartness by enabling their adaptation and autonomous behavior, while guaranteeing trust, privacy and security. (Atzori et al. 2010)

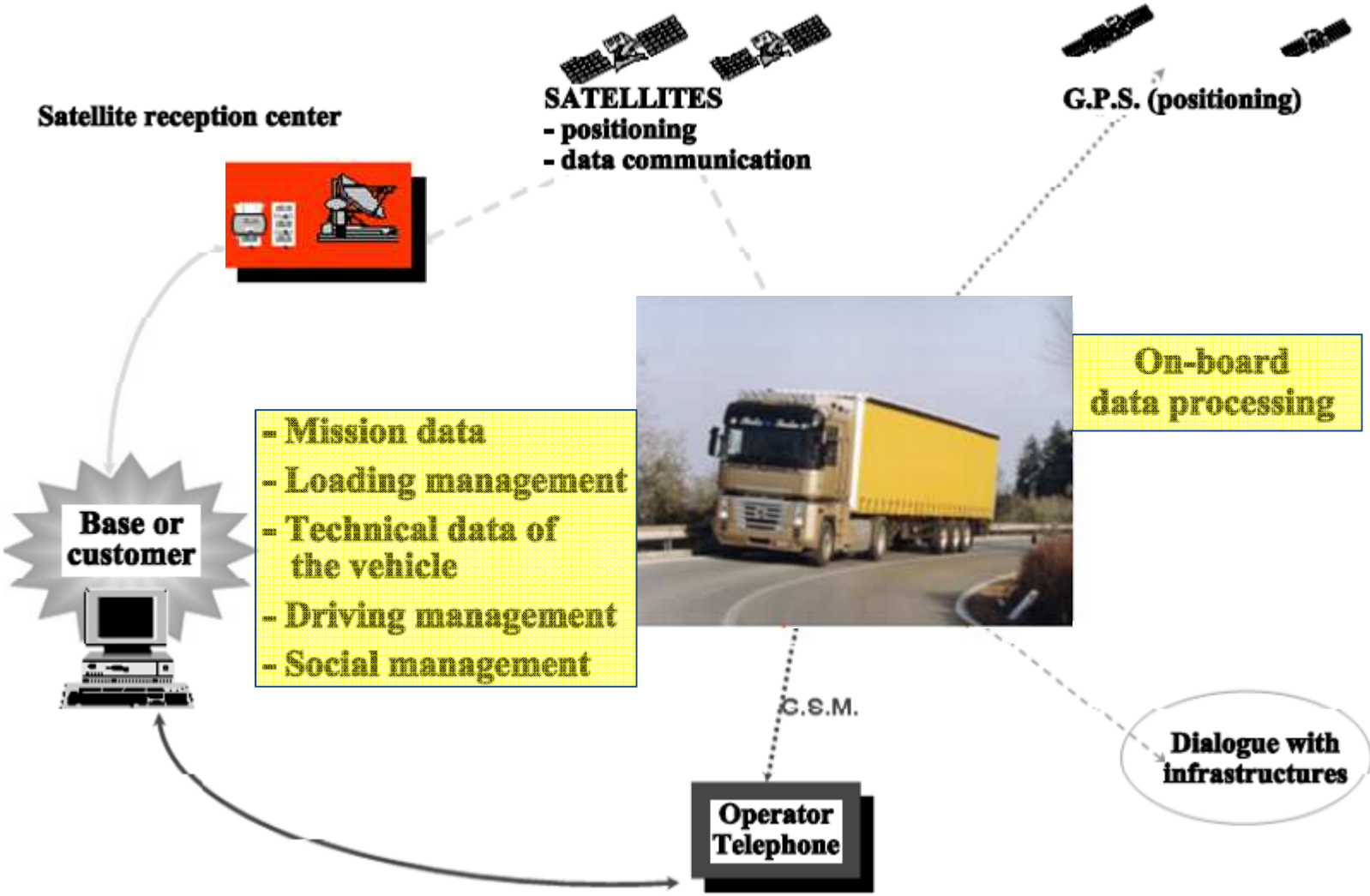
Introduction – Research method

Research method

- We are a ICT (Information & Communication Technology) research lab
- We are working on Design, Prototyping and Proof of Concepts approach (no industrialization and in field deployment)
- Consortium based multidisciplinary work with professionals and different field researchers
- All our projects were and are in relation with LUTB (transport and mobility systems) cluster and its industrials: Volvo, Renault Trucks, Irisbus …

  - Consortium based projects (ALF, ADViCe, Nestore)
  - Collaboration based projects (ECL & Plastic Omnium)
    France-China project on Smart City (ECL & ECPkn)

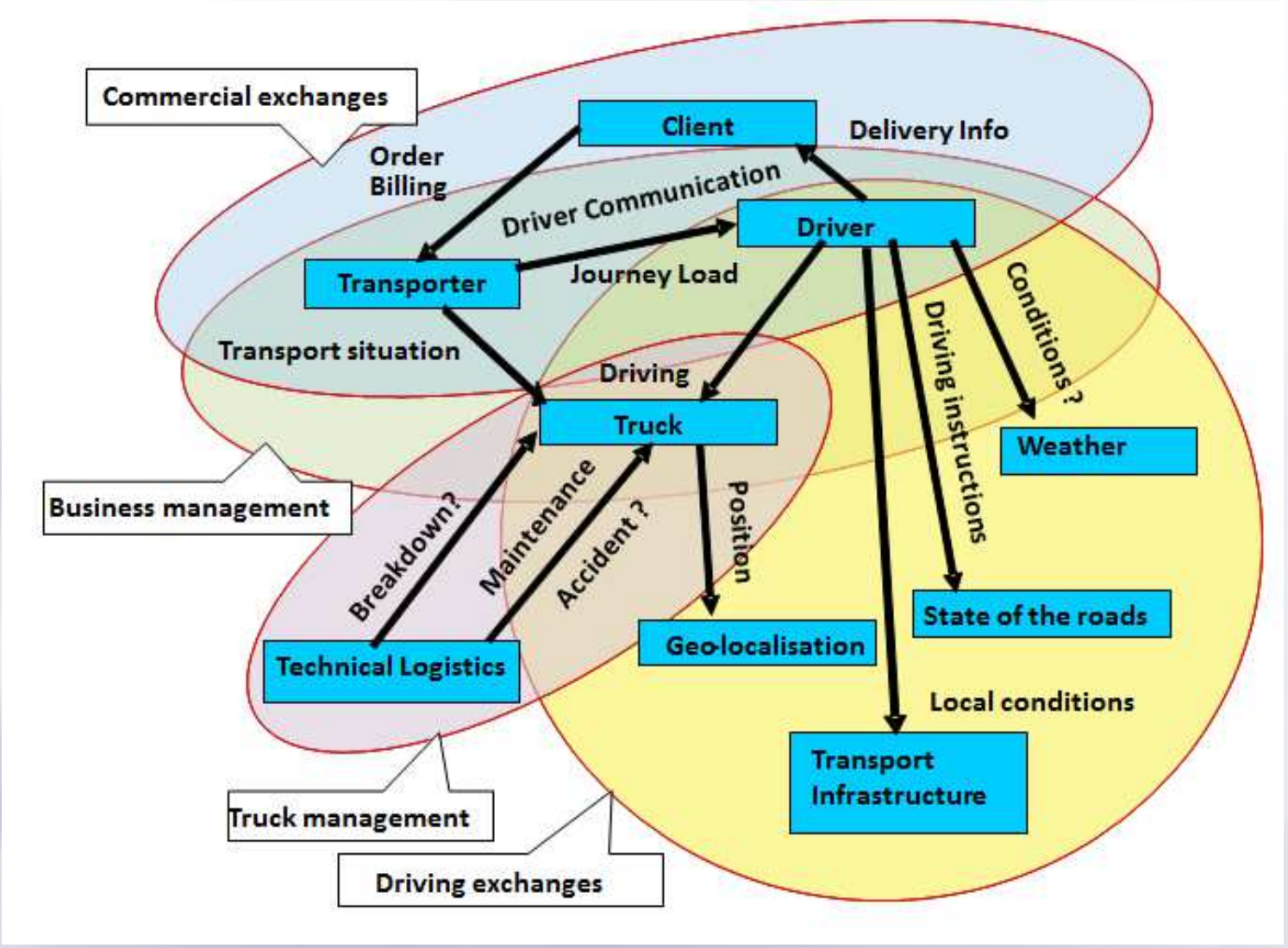
1 – Truck & Bus ecosystem



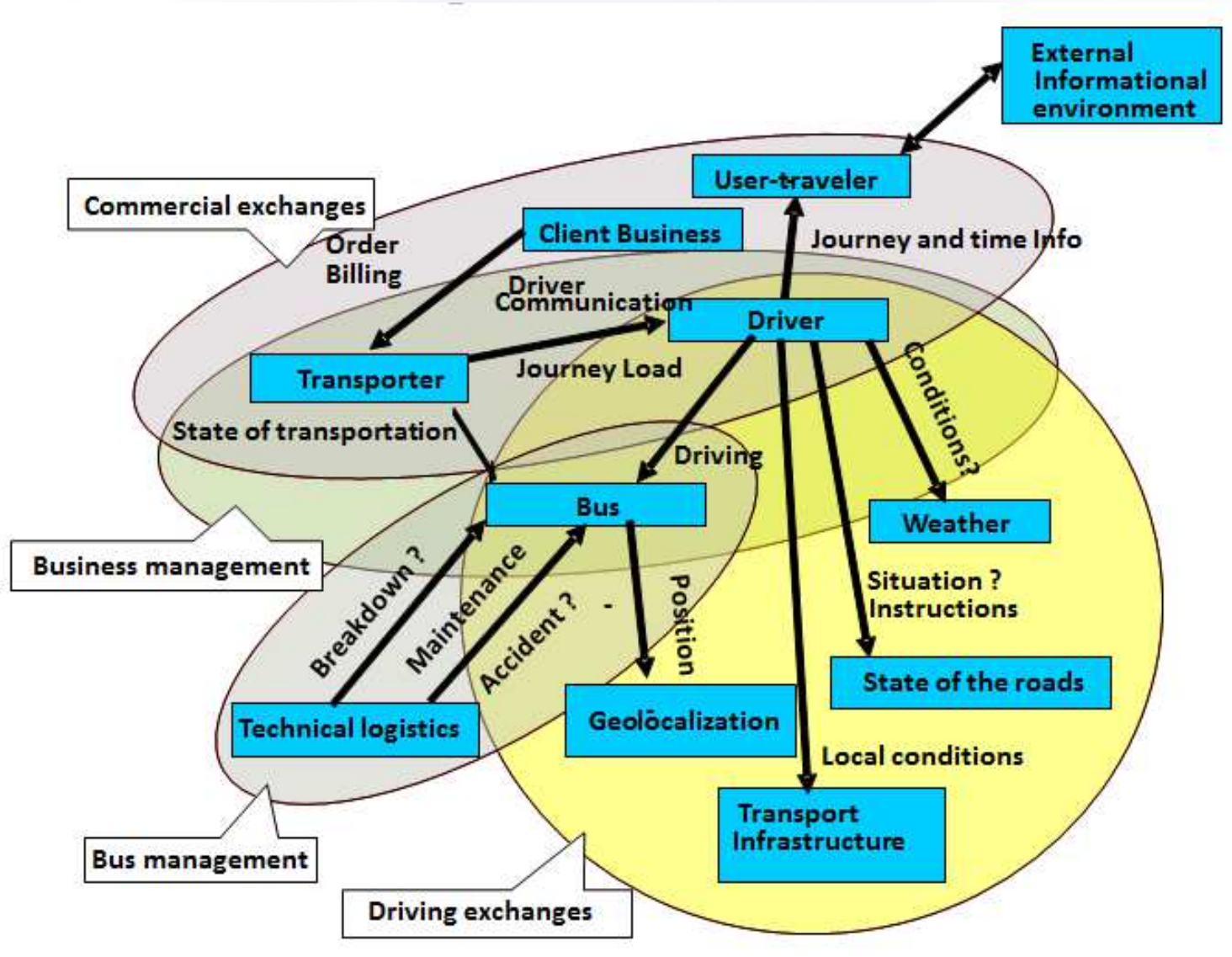
Information ecosystem for eBus & eTruck

- **Efficiency in operating truck and buses has always been a major concern for constructors, and especially for owners and operators.**
- **Identify truck ecosystem:**
  - truck itself: its technical state (incidents, accidents, overhaul, maintenance);
  - truck on the road: dynamic behavior, communication with the infrastructure, etc.;
  - truck and its crew: driving time, driver management, hotels;
  - truck and its load: optimization of journeys, cargo management and all the logistics.

Track Information Ecosystem



Bus Information Ecosystem



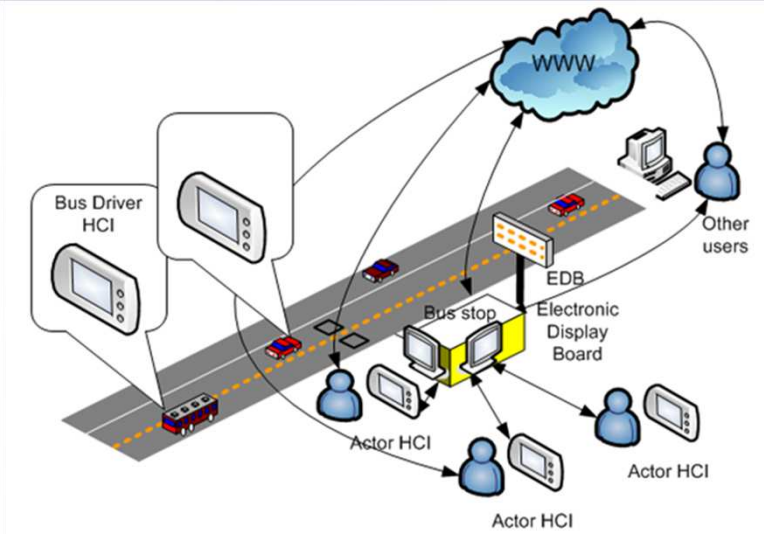
1 – Truck & Bus ecosystem - Results

This modelization was a starting for development of Information Systems and Smartphone based applications for track and bus users:

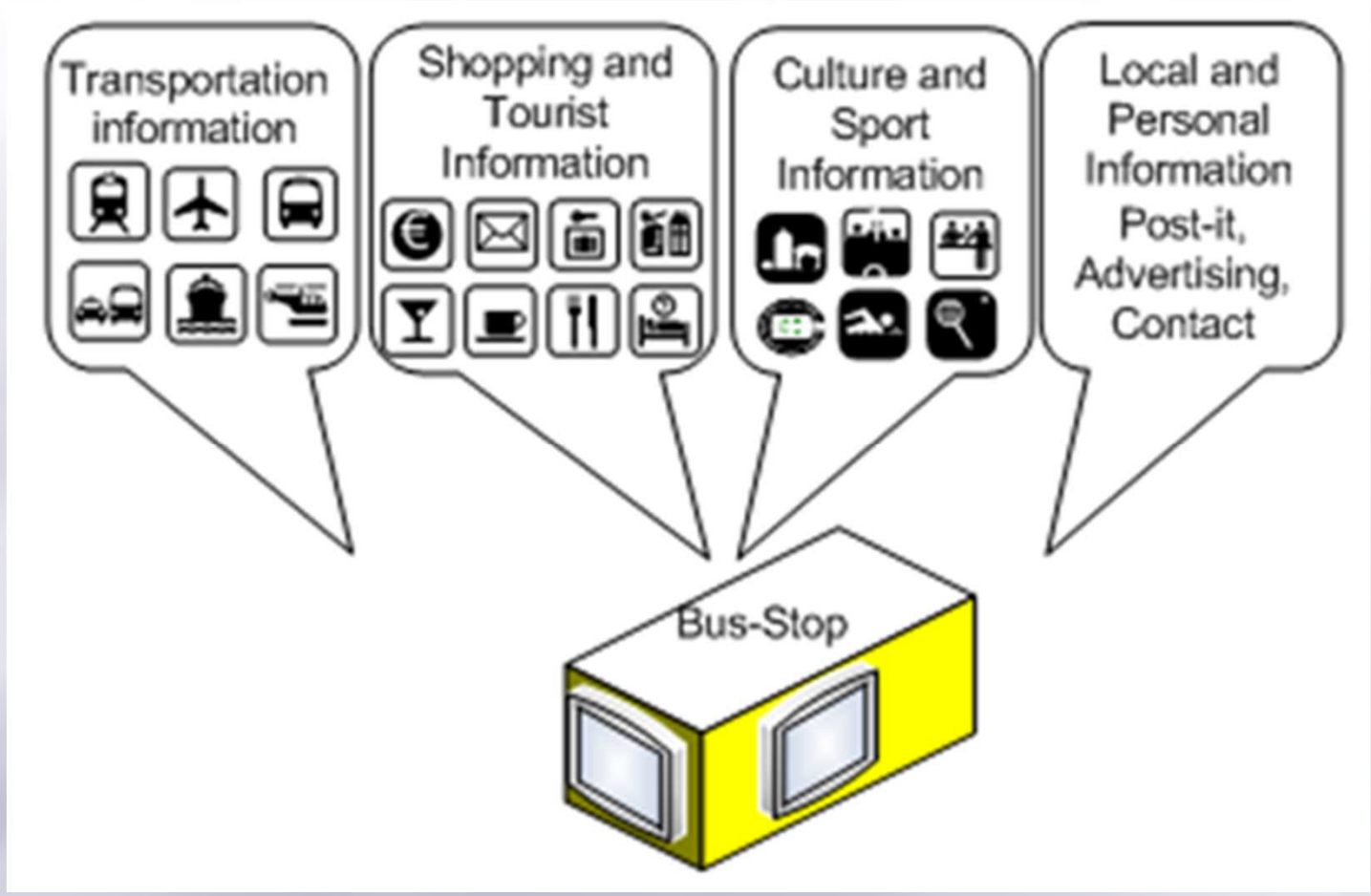
- Truck crew management (driving time, driver management, hotels)
- …

2 - Bus shelter++

- We proposed a **Bus Shelter as a hotspot** for mobile contextual transportation and social collaboration. The idea was to propose a new approach of **mobile web and location-based services** (LBS) for communication / collaboration which is based on a physical hot spot serving as an **accumulation point**; a hub for thematic and **social collaboration**.

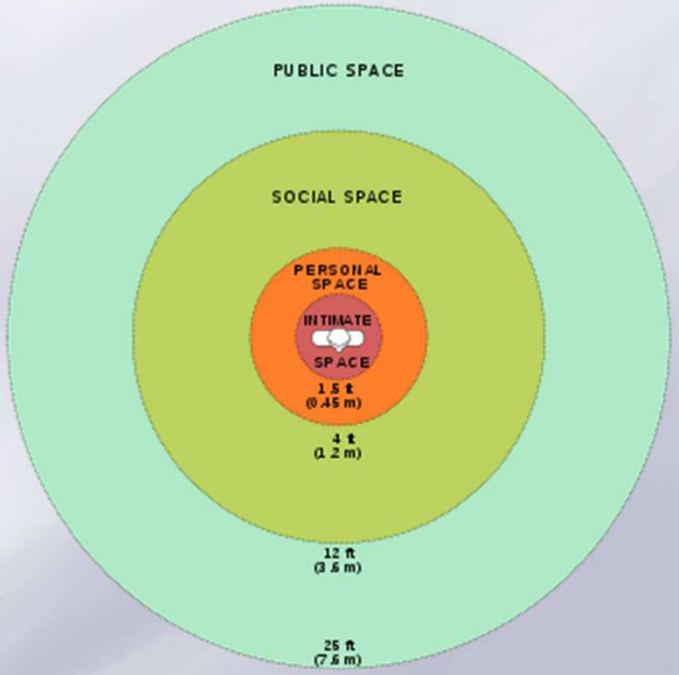


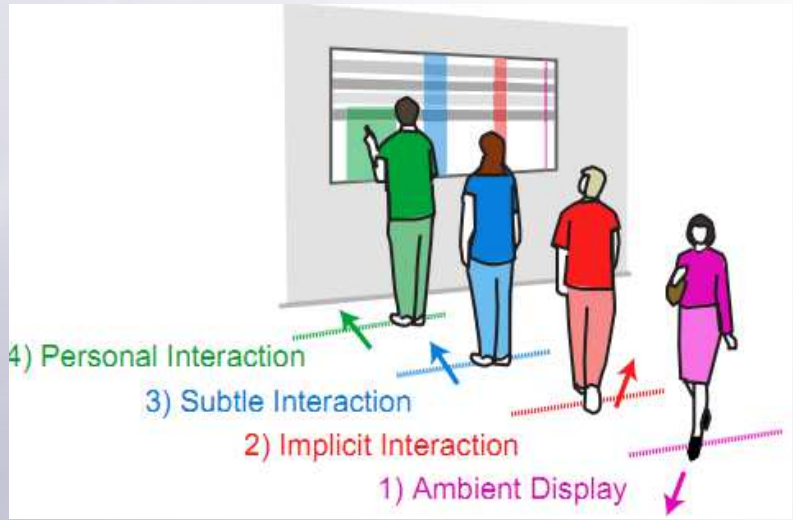
Bus shelter++


Transportation information
Shopping and Tourist Information
Culture and Sport Information
Local and Personal Information
Post-it, Advertising, Contact
Bus-Stop

2 - Bus shelter++ Large screen for multiple users

Proxemic UI with inversed level of details



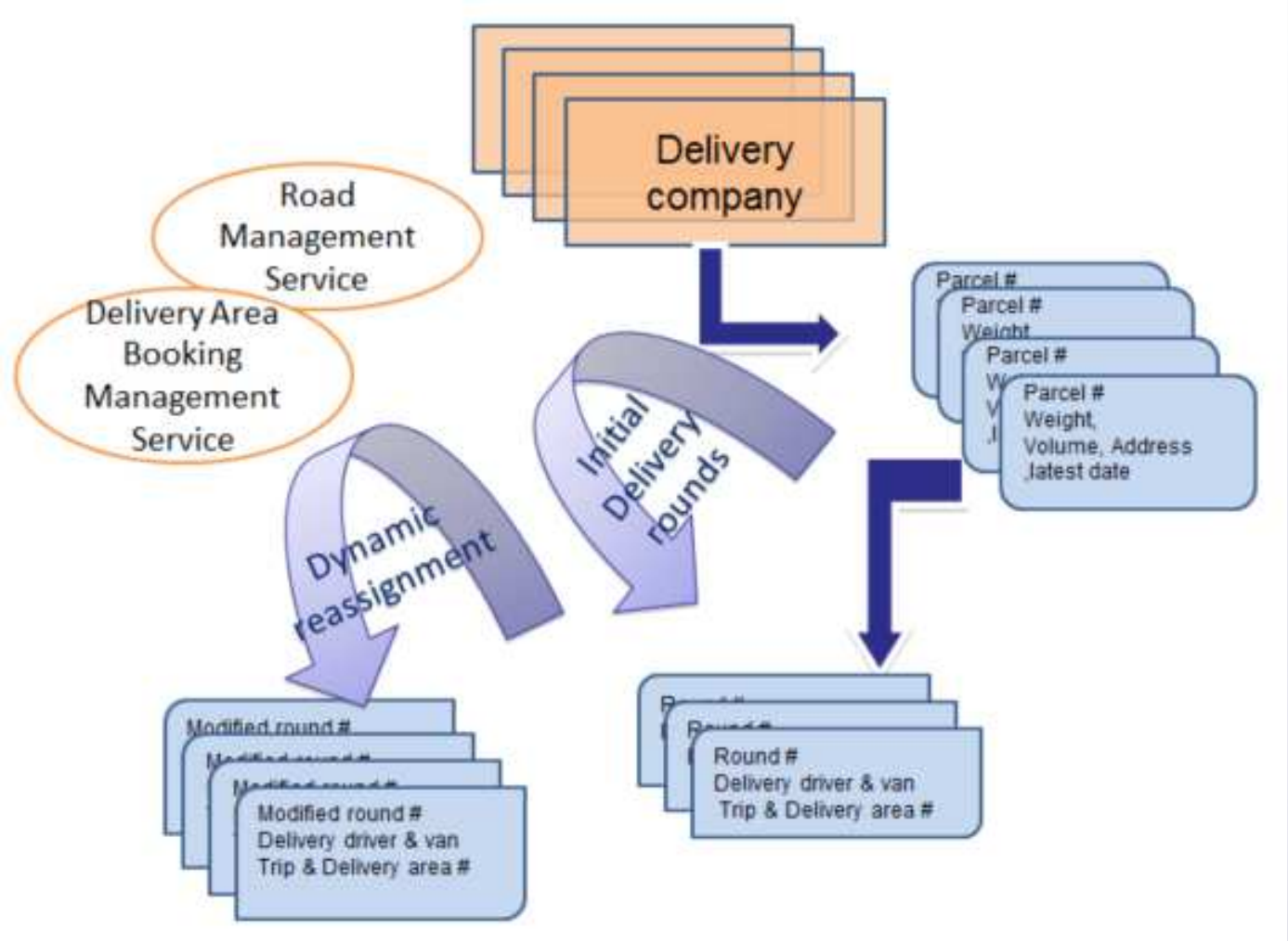


3 – ALF Project

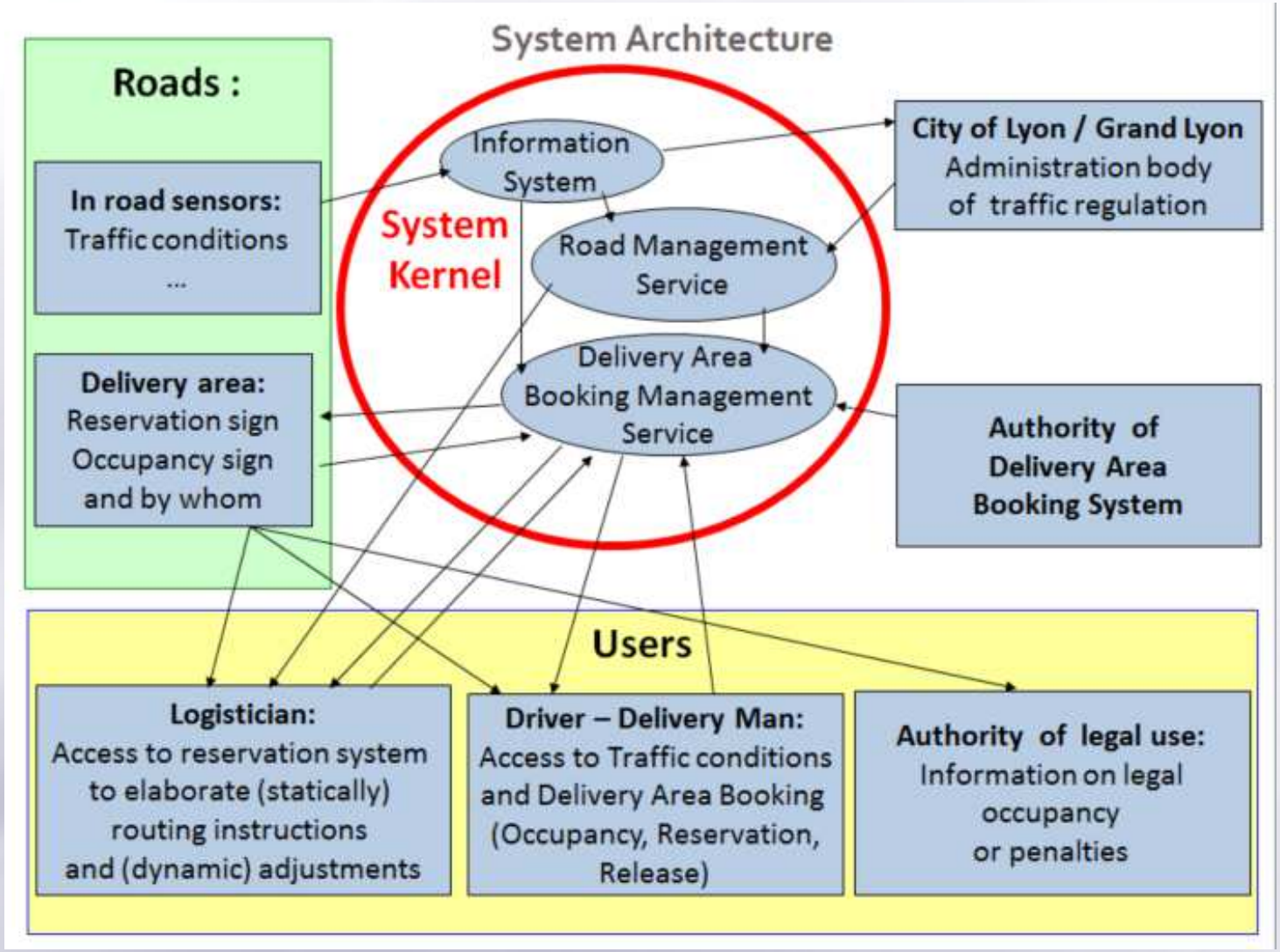
Freight distribution based on delivery area booking

- In European cities, and specifically in France, a large percentage (from 70 to 80%) are double-parked deliveries.
- Such behavior creates congestion, pollution and conflicts between road users.
- Delivery Areas were created to improve delivery drivers' work, and to decrease congestion.
- Nevertheless, deliveries continue to be double-parked, as the delivery areas are regularly occupied by non-authorised vehicles (mainly private cars).

Problem modeling

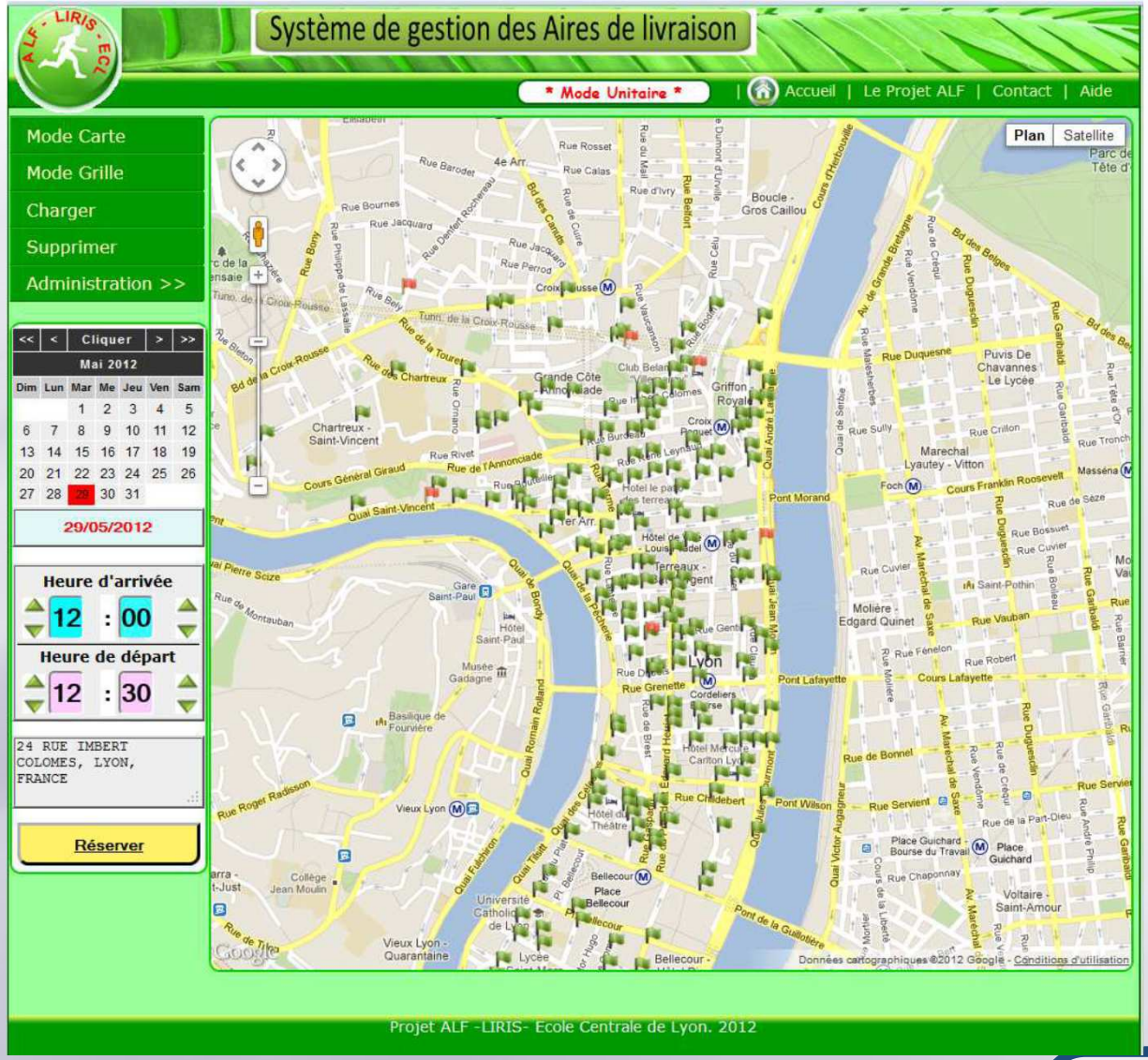


System Architecture



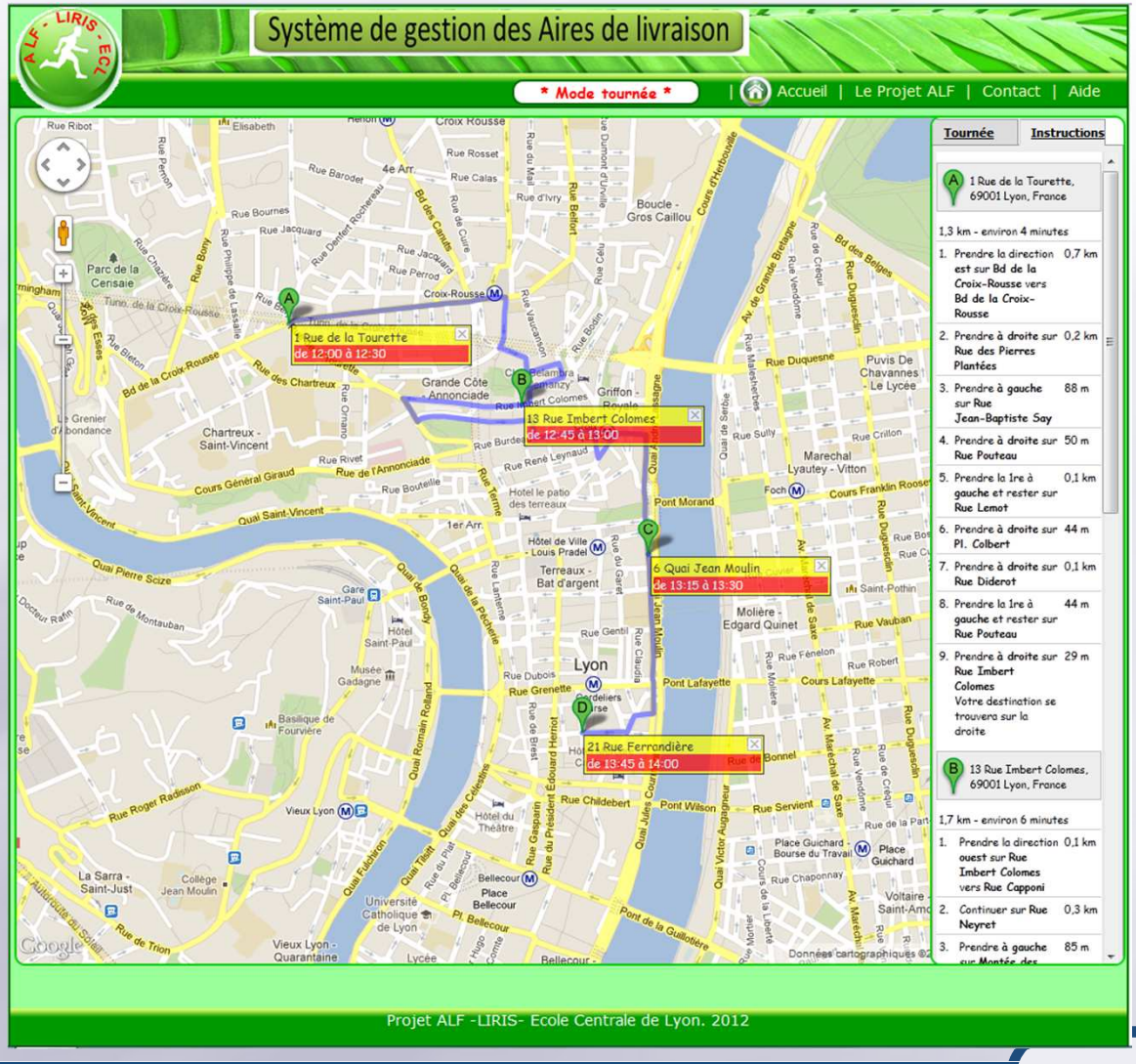
Interactive system managing delivery areas booking

SyGAL - Unitary booking



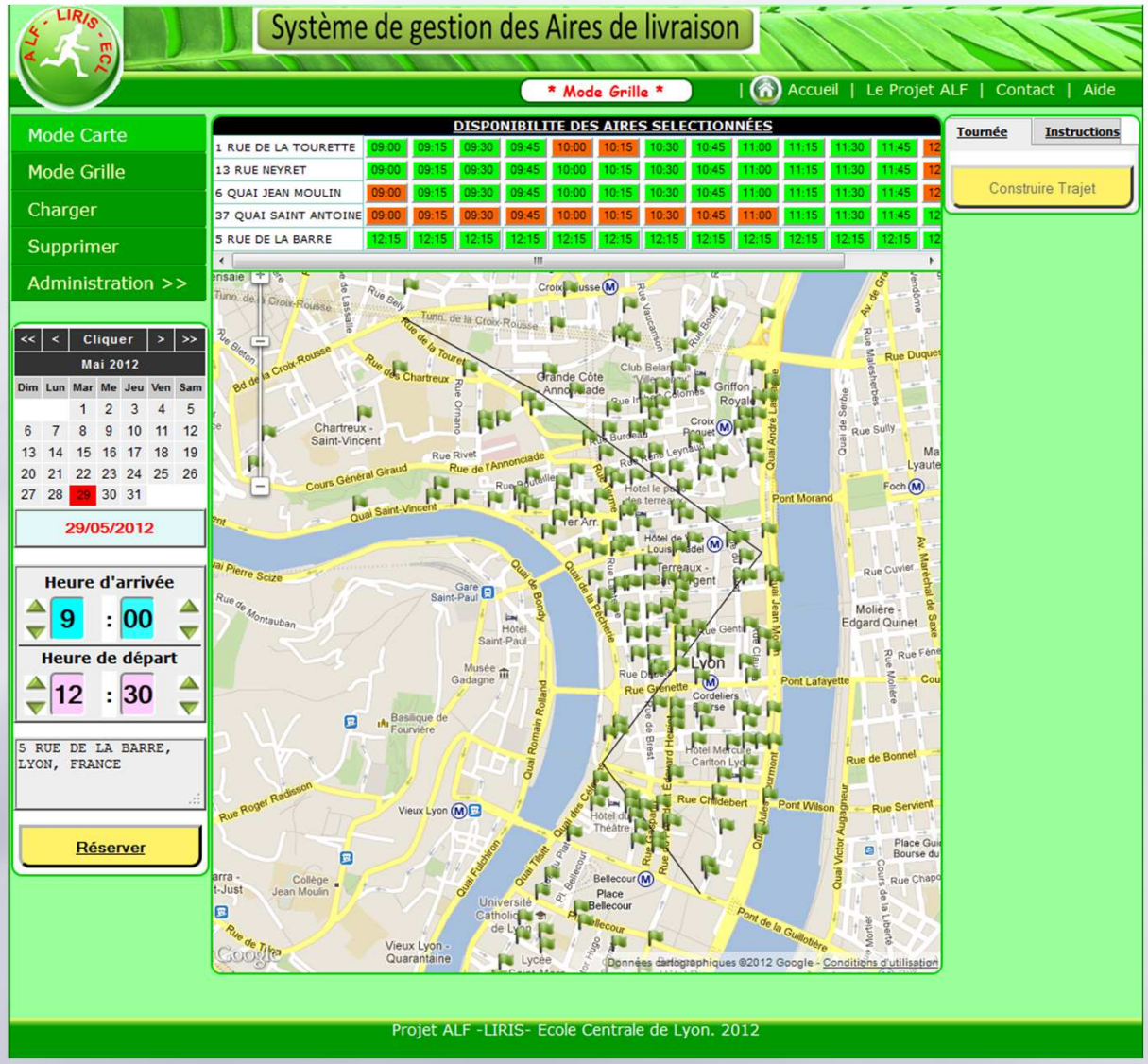
SyGAL

Round presentation (with navigation description)



SyGAL

Round modification based on Delivery areas occupancy grid



4 – ADViCe: Dynamic Road Lane Management

Different solutions for lane management

- Large cities (US, China) multiple road lane, may be specialized
- In European old cities with narrow confined streets, impossible to multiply road lanes
- Waste and poor management of static specialized

(NYC bus lane 2010)

Programme 190 – 0190 – THUR – BASF
Action 13 sous-action 04
11-MT-PREDITG02-2-CVS-050
Convention n° CHORUS 2100527197

(BBC news 2001)

Dynamic Allocation of Road Lanes

Emergency lane or lane reversibility based solution

Dynamic Allocation of Road Lanes

ICT Based solutions J. Nouvier study (CERTU)

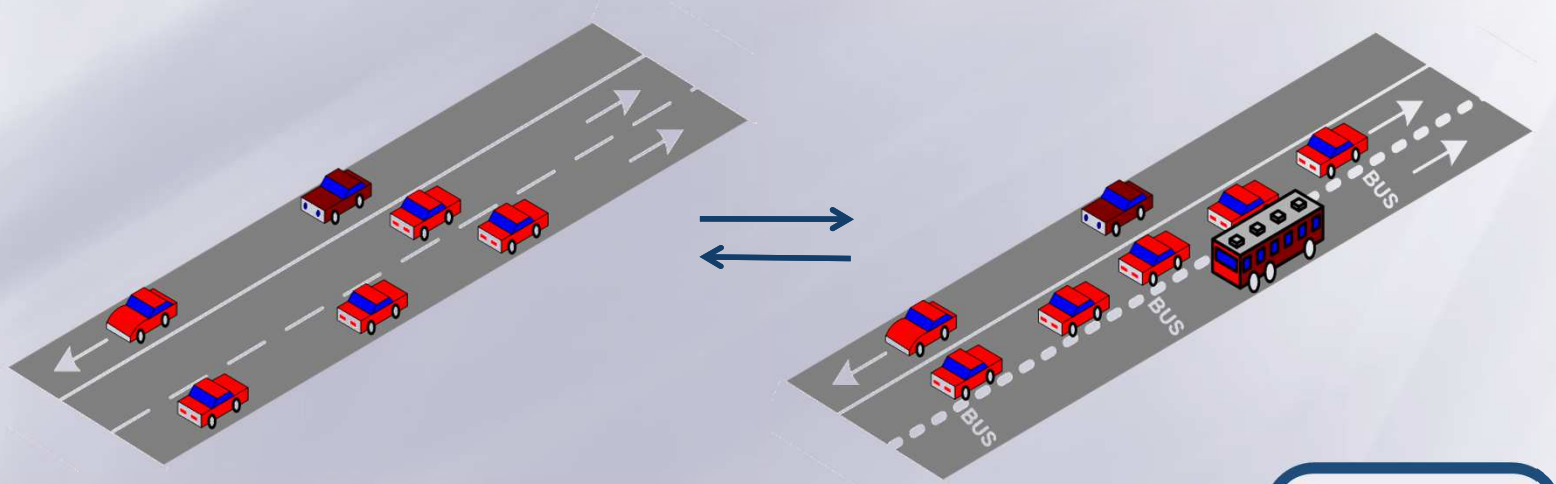
Horizontal signs

Vertical information

Dynamic Allocation of Road Lanes

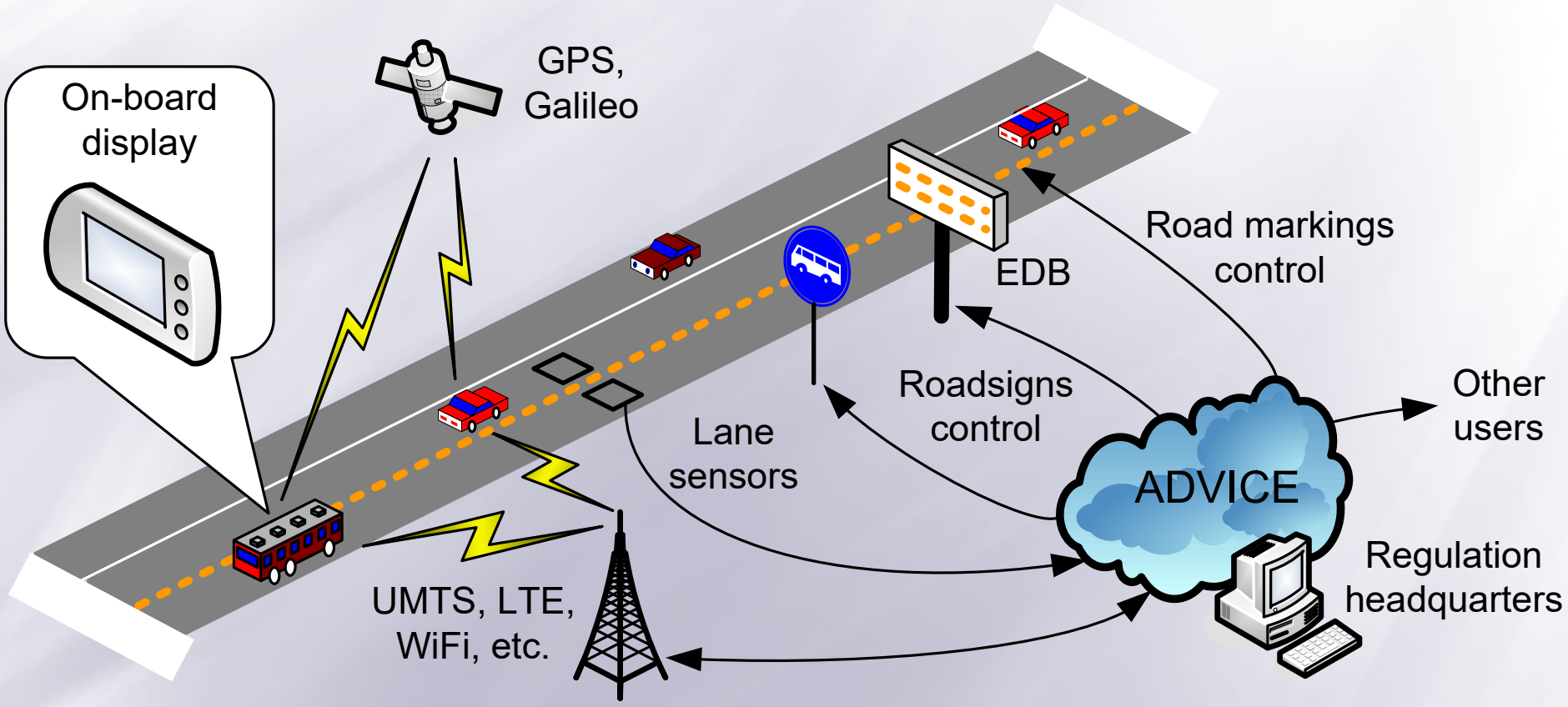
Dynamic Management

- Improve the efficiency of priority transport without significantly limit the available space for other vehicles
- Two operation modes
  - static allocation when needed: lane(s) for personal vehicles and lane(s) for buses or emergency vehicles
  - dynamic allocation when not enough buses, traffic not heavy
- Status propagated automatically to drivers



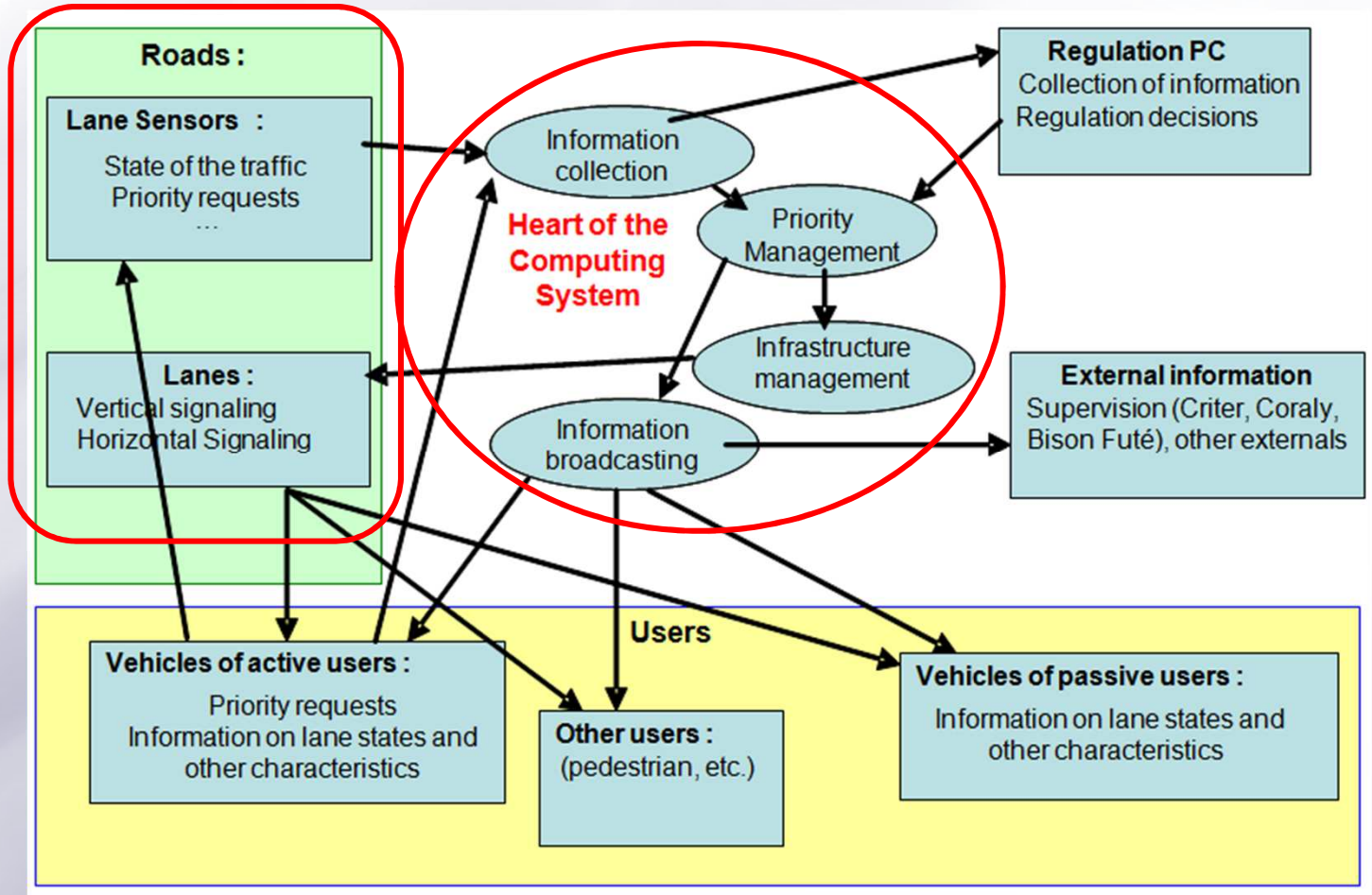
System Design

Overview of the System



System Design

- **Architecture**
  - Lanes
  - Sensors
  - Users
  - Info displayer
  - Regulation
- **User Interfaces**
  - In the vehicle
  - Outside



Visualization and Tests

User Tests

- Variable message signs
- Questionnaires of static photo of driving scene (by LESCOT/IFSTTAR)
  - Time consumed? User reaction?

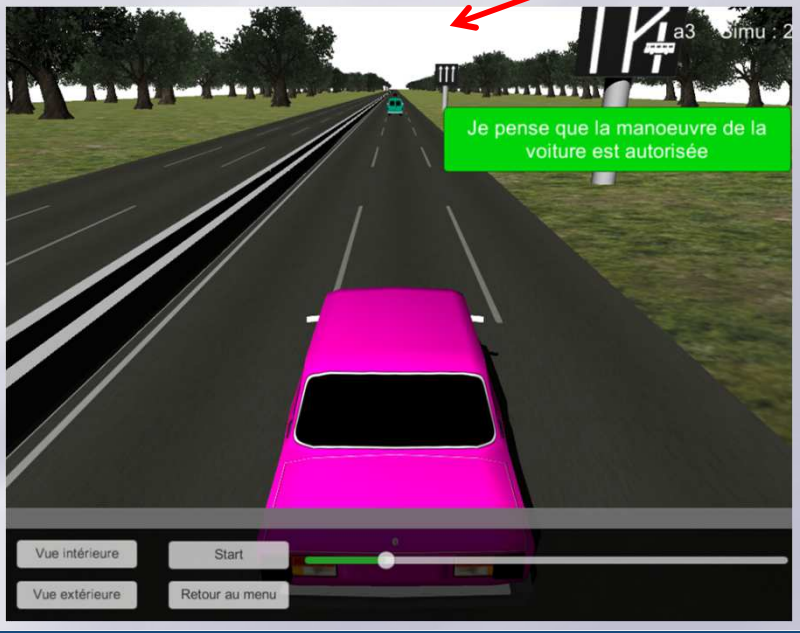
(Hugot et al. 2015)

- From now on, am I allowed to use the lane on the right?

Visualization and Tests

Dynamic Interactive Tests

- Study the driver's **dynamic reactions** in **limited time** related to vertical and horizontal road signs
- Take into consideration the speed of the vehicle and surrounding circumstances through rearview mirrors
- Interactivity in real time: **COMMENT** or **COMMAND**



5 - Carbon free parcel distribution

- Parcel distribution is a very important activity, time consuming, and a source of pollution and traffic jams, mainly in large cities.

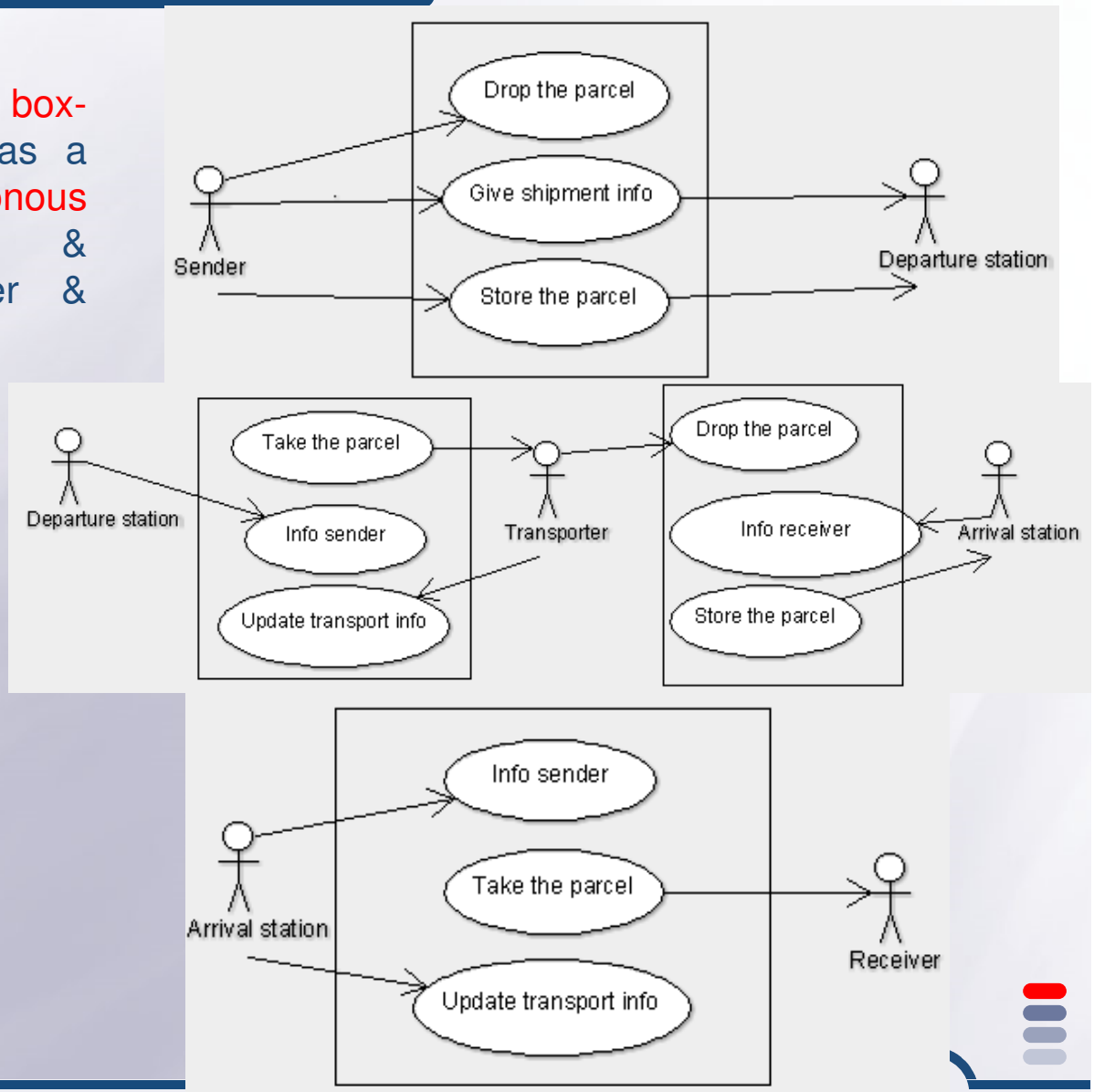
- From a collaborative economy point of view, a more original and effective approach, which is carbon free, is based on the use of existing movements of persons and vehicles to take advantage of these existing trips to have them carry out parcel transportation.

- We propose to examine three of the different working situations that we have identified:

  1. based on public city transportation users,
  2. based on supermarket clients and their neighboring
  3. based on a closed network of small craftsmen.

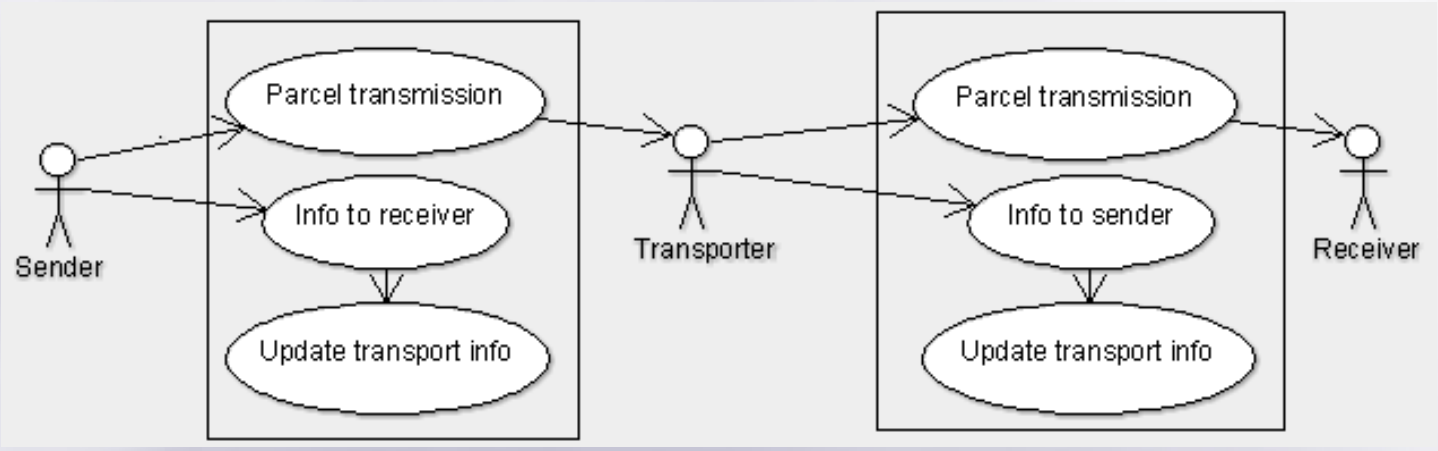
Asynchronous solution

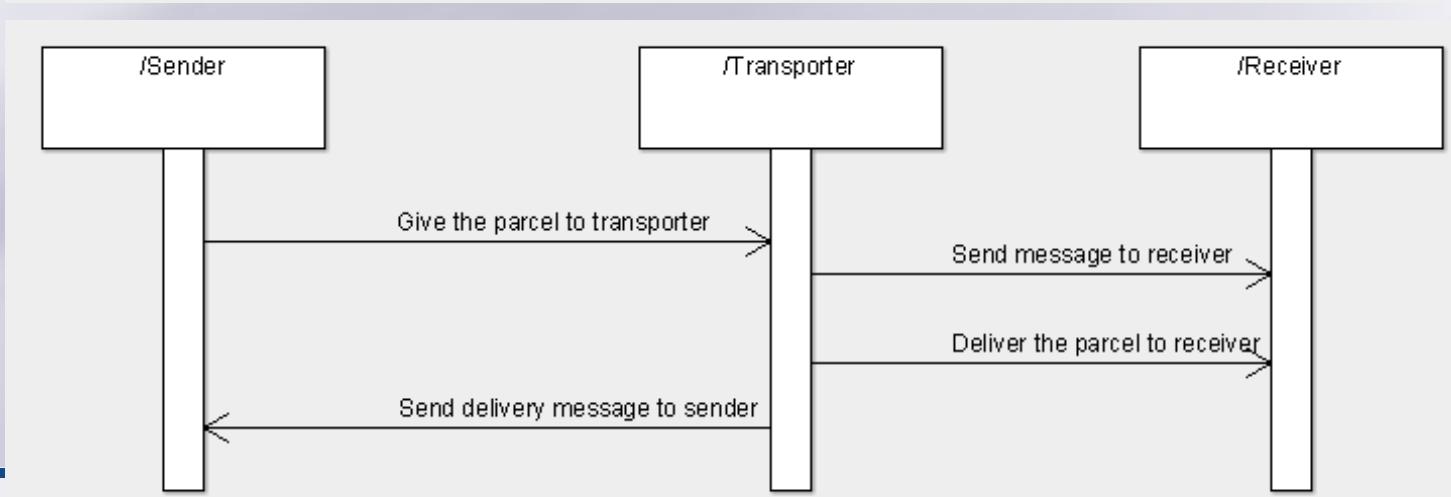
- In each subway station a box-locker is provided to act as a support of the asynchronous buffer between sender & transporter and transporter & recipient.



Synchronous solution

- Synchronous solution is based on direct exchange of the parcel between persons (sender & transporter and transporter & receiver). A scanning of the parcel must be introduced in order to allow its follow-up.





Beijing tube case study

北航中法工程师学院 Centrale Pékin

We studied with ECPk Beihang University students this case of parcel distribution based on public city transportation in Beijing in which we expected to use the subway.

We studied and proposed a method of intermediation based on an algorithm for Community Detection based on Hierarchical Clustering (CDHC Algorithm) described in the paper.

Market clients based parcel distribution Case study

- Another approach for carbon free distribution is based on market clients who are neighbors of the client waiting for his/her parcel at home.
- Intermediation: discover a transporter who is a neighbor of the final client (receiver):
  - At the shop level (list of clients serving as transporters)
  - At the shopping mall level (to increase the list of potential transporters)
- Traceability is required by scanning at departure and arrival (delivery to recipient).
- This approach could also be used by elderly or mobility reduced persons. Intermediation can be based on neighborhood association with short term (today) or long term objective (all the time).

6 - Box-locker-based fresh goods distribution: collaborative economy support

- The **pedestrian drive** is a variant of Drive, specially designed for pedestrians. Located in the city and accessible 24 hours a day, it allows ordered goods to be collected at any time. It is able to store not only ambient temperature products but also fresh and frozen goods.
- This fresh produce box-locker can be either related (owned) by a supermarket firm and totally integrated into the ordering, management and logistic process of the firm.
- It can be also managed independently. This case is an interesting support for shared economy, as the role of the pedestrian drive manager is to manage this use for multiple providers.

Nestore Pedestrian Drive

NESTORE is in charge is to ensure Internet access for all provider offers and to organize the corresponding supply chain with consumer information on availability of ordered goods in the box-locker.

In this way circular economy as short circuit of agricultural goods can be supported.

Conclusion and Future Work

- As a research team we are concerned by ICT progress and use.
- We try to use Web 2.0, Web 3.0, Mobile Web, IoT, LBS, AmI, Augmented Reality, and Mobile UI in various applications, mainly Smart City oriented.
- We designed and implemented several PoC for 6 projects presented earlier.
- In each case we identified all actors, corresponding activities and manipulated (created, used, deleted) data and associated technologies (displays,IoT, LBS, ..) in order to elaborate an appropriate ecosystem.
- We are interested by introducing of the Territorial view (theory and practice) in respect of the definition to by elaborated.

Thanks for your attention

- Questions?
- Bertrand.David@ec-lyon.fr