

## An elastic & global travel planning system For individually monitored real-time journeys

Thales assisted urban mobility prototype



Thales Services/Technical Direction/ Advanced Studies/SmartSys Lab.

# What

## (situation assessment)

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## Travelling in urban areas may now be based on a travel by travel basis

- ◆ Today travel planning systems (e.g. TomTom<sup>™</sup>, Waze<sup>™</sup>) are
  - Mostly addressing single modes of transportation
  - Not mixing public and private modes
  - Not taking current real time situation of all existing means into account
  - Not providing a specific solution for each demand
- Future travel planning systems will be able to
  - Provide a dedicated itinerary and planning for each demand even at rush hour
  - Monitor each provided solution in real time and adjust it to travel & external events
  - Optimize mobility at the urban area level, based on every traveller monitoring

The Instant Mobility prototype is a comprehensive early implementation of these concepts

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- 1. Initial individual planning ...
  - in a reference city (Bordeaux France), each urban travellers is individually requesting a travel planning solution to go from their current location to their destination

### 2. ... Based on RT status knowledge of transport means

 The planning system provide a specifically crafted solution based on its current real-time knowledge of the position, relative speed and capacity of all known transportation means

### 3. Traveller & transport means continuous tracking

- Once the solution is accepted by the traveller, the trips start and the traveller position is periodically reported to the planning system, along with the planned means of transport
- 4. Automatic planning adjustment in real time
  - Based on events received from means of transportation or traveller moves and planning system external criteria

### This must be done for each single traveller, even at rush hour

### A concrete example

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### **Travel solution automatic update**

17:55

Your current journey to: 1, Av. Augustin Fresnel in Palaiseau

You are now reaching : carrefour d'Orsay, still on your way to Massy Palaiseau station

You have travelled more slowly than forecasted. You will not make the 18:05 connection.

A new proposal has been computed :

At next crossroad, take new shared car going to Av. A. Fresnel (click to see & accept)

Arrival expected around 18:15 (+8 mn)

# How

## (system requisites and features)

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### Instant Mobility approach for success

### **Instant Mobility targeted approach for 3 dedicated usages:**



Based on current context, personal preferences, efficient on-trip monitoring and accurate traffic status and predictions

# Success achieved by simultaneously and dynamically taking into account all these needs

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### Full multi-modal mobility system



# Addressing three independent but complementary issues

- 1 Adjusting to problem complexity
- 2 Managing scalability dynamically
- 3 Monitoring resources in real-time

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- Multi-modality requires to efficiently mix multiple means of transportation in a single consistent and optimal journey proposal
- Journey monitoring requires to adjust to frequent events found during a journey, without adding the burden of multi-modality (such as multiplying delays, legs of trip, inconveniences)
- There is many mode of transport, each having its own requirements (sorted by increasing complexity)
  - Pedestrian only
  - Pedestrian + Public transports (+ pedestrian)
  - Pedestrian + car (+ pedestrian)
  - Pedestrian + Public transports + car (+ pedestrian)
  - Pedestrian + car + Public transports (+ pedestrian)
  - **o** ...
- The complexity comes from the increasing combination of pick-up and drop points for acceptable solutions in multi-modal schemes

# The accuracy of each proposed plan for a journey is bounded by computation time



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Ideally, the system must accommodate at all times all travellers and drivers in a dedicated urban area

- Providing each traveller with an optimal trip planning
- Providing each driver with an optimal itinerary
- Achieving the highest rate of means of transportation sharing

Thus overall scalability between rush hours and empty hours is of the order of magnitude of 10<sup>2</sup> up to 10<sup>3</sup>

 Adjusting from thousand travellers up to millions for one or two hours

At these levels, the stability of the mobility system in the addressed urban areas becomes critical

 Distributing travellers and drivers over multiple itineraries is an absolute requirement

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# The prototype aims to monitor in real time all people & ressources interacting directly or indirectly, with each or any journey

- Road capacity is given by the current mean speed on each road segment
- Public transport capacity is reported directly (for each bus, metro, ...)
- Private car capacity comes from each driver
- Drivers & travellers positions are reported in real time

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# What

## (solution assessment)

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### The prototype context

#### The prototype is using data located in the Bordeaux urban area

- Some figures...
  - Bordeaux conurbation: 27 municipalities
  - Daily commutes within the conurbation: 3, 224 millions

Modes	тс	МАР	Vélos	2R Mot.	VP	Autres	Total
Volumes	302 072	675 758	108 118	44 012	2 045 042	49278	3 224 280

- The prototype use data from effective origin-destination travels from home to work and home to school
- The simulation currently use 450 K travel per days (departures only), i.e. 10% of effective journeys in the urban area
- The density of cars and buses reflect the reality
- The journey density along the day is preserved

#### \* Overall, the purpose of the prototype is also to show a realistic simulation of the local situation Commercial in confidence

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### More figures on the Communauté Urbaine de Bordeaux



Source : french census 2008 ; Schéma directeur opérationnel des déplacements métropolitains, Communauté Urbaine de Bordeaux Commercial in confidence Thales Services/Technical Direction/ Advanced Studies/SmartSys Lab.

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### **Real-time multimodal situation**

#### The supervision GUI of the Bordeaux prototype



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### **Prototype Full Architecture**



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