

The deployment of motorways sensors to improve the traffic management and client information

**Working session 3B:  
ITS – political commitment and effective deployment**



Motorway sensors deployment

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# 1 Motorway sensors deployment

## 1 Background and objectives

**Traditional traffic measurements** are based on technologies like:

- Loops, radar or image processing.
- Obtained parameters: Traffic density (ADT), speed and length categorization, average speed and occupancy time.

**Objectives:**

- Journey Travel times for short and long distance.
- Measurements of the time taken to pass-through toll plaza.
- Level of service using key indicators.
- Incident detection systems operating in real time.
- Source/destination traffic matrix.
- Traffic management applications
- Statistical information

# 2 Motorway sensors deployment

## 2 Bluetooth technology (i)

• **Bluetooth** is an open wireless technology standard for exchanging data over short distances from fixed and mobile devices. Maximum distance range is around **100 meters**.

• **Sensor concept:** Read MAC address of Wifi and Bluetooth devices driving-through the motorway.

• **Bluetooth devices:** mobile phones, PDA's, hand-free kits, GPS onboard unit, laptop, etc.

• **"Invisible capture"** for the user. The customer does not perceive any felling of surveillance.

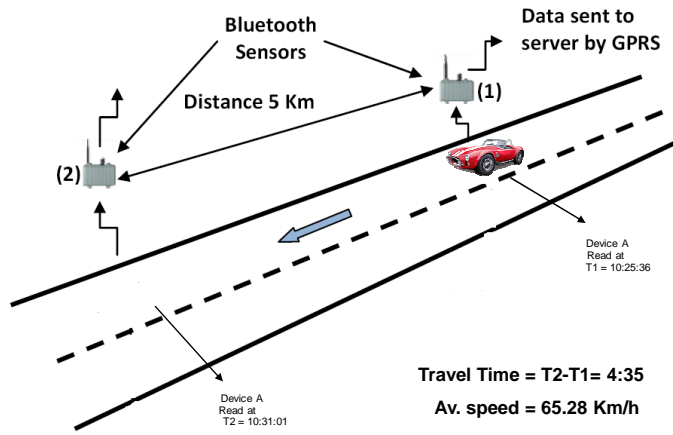
• The device information collected by the sensor can not be associated with the device's owner, whose **privacy** and user information is guaranteed.

**Does not use signal coming from mobile operators.**

**A real alternative for ALPR or OBU systems.**

## 2 Motorway sensors deployment

### Bluetooth technology (ii)

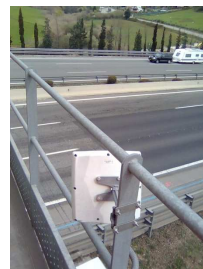


## 2 Motorway sensors deployment

### Bluetooth technology (iii)

Installation:

- Over available infrastructures (Gantries, poles, etc.).
- Energy available
- GPRS or 3G Communications
- One sensor covers both directions
- Maintenance and installation non- intrusive
- Reduced dead-lines for deployment

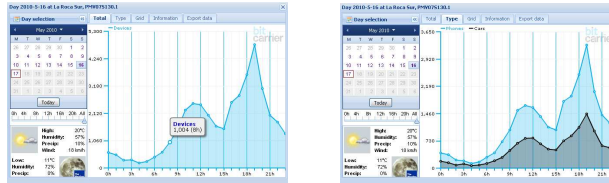


## 2 Motorway sensors deployment

### Bluetooth technology (iv)

Detection percentage (1):

- Average device detection by Node: 40 %



- Average device detection in consecutive nodes: 30 - 40 %

(1): Comparison was done using bluetooth data vs traffic density on La Roca Toll Plaza.

#### Conclusions:

Detection percentage is enough to achieve the objectives defined previously. This technology does not allow the measurement of ADT as well as vehicle categorization.

## 3 Motorway sensors deployment

### Trial results (i)

**Scope:** some stretches on AP7 motorway.

**Period:** March - December of 2009

**Equipment :** 8 sensors

**A)** La Jonquera- Frontera (8km): 2 Nodes => **Border-Cross Time**

**B)** La Roca Toll Plaza: 2 Nodes => **time pass-through toll-Plaza**

**C)** La Roca - Maçanet (40 km): 4 Nodes => **Travel Time journey**

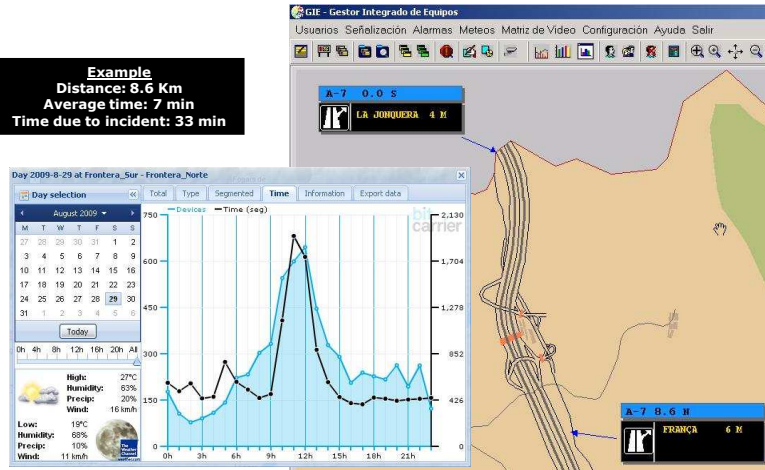
**System platform :**

- **Web Application.** (Level of service & I/S graphs in real time)
- Data export process for statistical analysis.
- Data exchange of travel time journey and **integration in Traffic Control Center.**

### 3 Motorway sensors deployment

#### Trial results (ii). A) Border-cross time

**Example**  
Distance: 8.6 Km  
Average time: 7 min  
Time due to incident: 33 min



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### 3 Motorway sensors deployment

#### Trial results (iii). B) time pass-through toll-Plaza



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### 3 Motorway sensors deployment Trial results (iv). C) Travel time journey



### 4 Motorway sensors deployment Guidelines for future developments

- **The deployment of Bluetooth sensors** in Motorways:
  - Travel time journeys.
  - Level of Service for Toll-Plaza and motorway.
  - Traffic Key indicators (hours of congestion, etc.)
  - Alert and incident automatic detection.
- **Data fusion process using tolling data system and loops**
  - To increase and improve the reliability of the system.
  - Traffic management applications
    - Variable Speed Limit.
    - Ramp Metering, etc.

## 5 Motorway sensors deployment

### Conclusions

The main **advantages** of this newest technology are:

- **Real calculation** for travel time and average speed.
- **New services or applications:** Automatic Incidents Detection,
- **Reduced investment** – per measurement section versus the others market technologies.
- **Lower maintenance costs.** Non-intrusive system in road-side configuration and a unique sensor can cover both directions.
- **Short dead-lines installation.**

The main **limitations** of Bluetooth technology are:

- **No Traffic categorization.**
- **Variable detection percentage of detected 'vehicles'** depending on the activation and diffusion of Bluetooth and Wifi technology and traffic conditions.

Many thanks for your attention

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