# Industry transfer, from traffic prediction to collaborative navigation solutions

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# INDUSTRY TRANSFER, FROM TRAFFIC PREDICTION TO COLLABORATIVE NAVIGATION SOLUTIONS

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## Introduction

LaRA (*La Route Automatisé*), the Joint Research Unit between IMARA Lab at INRIA and CAOR Lab at Mines Paris, improves the state of the art of traffic prediction technology through statistical modeling based on instrumented probe vehicles. Working together with European industrial and research partners like TNO, Motorola and Intempora, the European project REACT demonstrated a breakthrough technology based on integrated in-car sensing and a traffic management center. SENDA, an INRIA's spin-off company licensing LaRA's traffic modeling technology, learned lessons out of REACT to overcome technical issues for cooperative system's deployment.

## The REACT approach for European road transport efficiency

The goal of cooperative systems like REACT is to increase the efficiency of European road transport by communicating to the driver up-to-date information on road conditions. For this, vehicles sense real-time natural and infrastructure conditions within and in the vicinity of each vehicle, transmit these data to a central server where they are aggregated and analyzed by an integrated set of models to generate both vehicle-specific recommendations and information for relevant authorities.

## Analyzing traffic with probe vehicles to generate customized road advises

The analysis of the traffic conditions and safety risks of different routes can only be done in a central server that collects and analyzes data coming from a large number of geographically distributed vehicles.

REACT has key advantages over current systems:

- Mobile rather than stationary sensors, which cover all routes where vehicles travel
- Measurement of relevant natural as well as infrastructure conditions
- Customized, model-based recommendations transmitted to individual vehicles.

All the technologies has been integrated into a fleet of instrumented cars. Figure 1 shows LaRA's fleet for cooperative vehicles' technology research used in the project.


**Figure 1. REACT sensor vehicles: 4 LaRA C3.**

#### Issues on technology transfer

While a proof of concept might be enough to validate research activities, actual innovation, in the sense of the economical exploitation of a new technology, needs to go further on the interpretation of certain results. Hence looking forward to innovate in traffic technology, lessons learned from REACT are mainly three. First, the number of players necessary to put in place a running cooperative system based on probe vehicles for road efficiency (e.g. public road operator, software company, equipment provider...) is big. Moreover, players' aims and behaviors are often dissimilar Second, the integration and successful communication of a "proof of concept" initiative is an excellent tool to make these concepts comprehensible and stakeholders more prone to discuss and move further to operational solutions. Third, there is technically a threshold of deployment difficult to reach (a percentage close to 3 to 5 % of the vehicles running in the entire road network must be equipped) to make traffic technology based on probe vehicles exploitable.

#### SENDA's alternative, Internet Personal Navigation Device for Collaborative Navigation

SENDA, a mobility-oriented software company "Born of INRIA", licenses LaRA's statistical model for traffic prediction based on probe vehicles, developed during the research project REACT. Putting together the technical constraints for deployment of such breakthrough technology with the need to reduce the number of concerned players in the value chain, SENDA conceived an alternative approach: A collaborative GPS navigation device.

This high-end navigation device corresponds to European drivers' demands for improved route guidance, based on better quality road traffic information and higher coverage of the road network. The principle is simple, the GPS navigator is supplied with an embedded wireless Internet interface and a functionality to act as a mobile traffic sensor. Therefore the navigator" position and speeds are anonymously transmitted to a central management server that process statistically this information and then consolidates it with the data-flow coming from the road operator's traffic information centre.


**Figure 2: SENDA's Personal Navigation Device for Collaborative Navigation**

This concept for innovative navigation is derived from INRIA's previous works in European projects Cybercars and Ozone, and from SENDA prescriptive navigation. The latter was selected finalist at the European Commission's GST Service Submission Contest. SENDA's first prototype of collaborative navigator was introduced during the ITS World Conference 2006. Commercial vehicle renting companies are already interested in such approach and discuss with SENDA about the implementation of pilots of high-end GPS navigation for professional drivers.

### Conclusion

SENDA benefits from LaRA's research outputs to innovate in traffic prediction technology that is necessary for the next generation of traffic management systems. Lessons learned out of REACT experimentations helped SENDA move ahead on their reflections, and synthesize a convenient product targeting an emerging market. Deployment of traffic prediction solutions by SENDA will provide valuable real-world feedback to LaRA's research in terms of empirical evidence, to improve and test predictive models.

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