Project Results

CarCoDe

A double-edged software platform – cooperative in-vehicle services and business opportunity

Executive summary

In response to growing demand worldwide, the ITEA 2 project CarCoDe set out to create cross-platform software enablers to support the development of cooperative in-vehicle services that not only enhance the everyday lives of citizens but also boost productivity in many business sectors. These services can be incorporated in an on-board system that seamlessly uses alternative wireless communication technologies, provides essential information quickly and automatically, and uses that to boost traffic safety and user applications.

Project origins

Modern vehicles are increasingly becoming four-wheeled computers that are aware of their operational state and their surroundings through sensors, radars and GPS capabilities. The latest trend of sharing information between vehicles and between vehicles and transport infrastructure requires software-intensive, in-vehicle applications and services. But scalability, communication cost, information overload and service dependability and security are all challenges that require content-centric networking. In other words, the communication must be medium agnostic and have improved data redundancy between applications and distributed design. The key to meeting the challenges posed lay in platform independency to enable critical mass for large data usage and collection.

Technology applied

CarCoDe developed a software platform that aids the development of services to nomadic on-board devices and enables traffic-service ICT eco-systems as well as generates business opportunities whereby a merging layer is created between the automotive industry, traffic service operators and third-party developers.
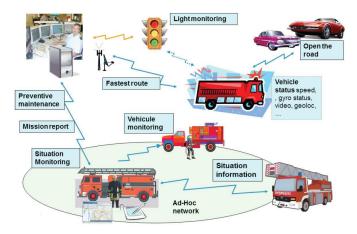
The architecture developed within the project allows seamless cooperative wireless data gathering/sharing and delivery among vehicles through heterogeneous networks with network selection algorithms. Essentially, the platform simplifies the design process, speeds up programming and generates fewer errors and a shorter testing phase as well as better facilities for application developers. Not only did the project utilise the results of standardisation activities but it supported them by providing novel solutions that could themselves become standards. The project's technology solutions have been demonstrated at public events and symposia with the scientific results having been published in academic papers in international scientific workshops, conferences and journals.

CarCoDe demonstrator

Making the difference

The new approach to content-centric networking architecture and the security technologies are likely to be widely applied and will accelerate the development of application software for a range of on-board vehicular systems, such as public safety mobile systems and remote vehicle monitoring and diagnostics devices. In turn, an improvement in the quality of vehicular systems will be a boost to safety-enhancing systems.

As for exploitation, several industrial and SME partners have already set up post-project collaborations while the provision of both dedicated hardware platforms and software for emergency services has created a complete and new market range, thereby responding positively to market demand. Furthermore, the project outcomes also provide urban planners and

managers with an evidence-based foundation to help and refine surface transport planning and optimisation, as well as a better understanding of vehicle flows, both geographically and temporally, so that citizen-oriented services and facilities can be planned.

The consortium partners have benefited from the results in various ways. For example, Airbus DS has introduced new services and new applications into integrated security systems for its customers (first responders, fire-fighters, police) and has enhanced some products and services such as broadband wireless networks and routers, and its automatic vehicle location application with the addition of the CarCoDe OBU data. Thales is exploiting CarCoDe results to get data in real time for its current system that uses offline data to make the system more reactive, more efficient and, therefore, more powerful. Other beneficiaries include DUNASYS, Evoleo and Mecalbi – the latter enhancing its Remote Car Diagnostics platform – while TOFAS and Turkcell will be integrating the remote diagnostic feature in a project about intelligent vehicle infotainment systems and PTIN has improved its M2M products and services with new standard functionalities.

Future prospects

The potential public safety market (including transport and industry activities) is 30 million users worldwide. Governments and industry are both keen on complete solutions that improve the security of citizens and infrastructure and facilitate rescue. The platform developed by CarCoDe may crucially shorten the development cycle of applications and thus enable their rapid adoption in an environment of almost unlimited consumer and business opportunities.

Partners

France
Airbus Defence & Space
DUNASYS
NXP SemiConductors
Thales Communications and Security
University of Burgundy
University Paris-Est Marne-la-Vallée

Portugal
Evoleo Technologies
Instituto de Telecomunicações
Instituto Politecnico de Castelo Branco
ISEP /Cister
Mecalbi Engineering Solutions, Lda -
  Actividades
PT Inovação

Turkey
Telenity
TOFAS
Turkcell Teknoloji Plaza

Project start
December 2012
Project end
December 2015

Project leader
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Major project outcomes

Dissemination
- More than 30 Conference papers and presentations (IEEE, ACM, GIS-ITS, Critical Communications World, etc.)
- 8 journal papers (IEEE Transactions on Vehicular Technology, Elsevier Vehicular Communications Journal, etc.)

Exploitation (so far)
- New products:
  - Broadband wireless networks routers
  - On-board units
  - RoutesMobilityModel ns-3 module
  - Remote Car Diagnostics platform
  - SmartM2M ecosystem
- New services:
  - AECFV: An accurate and efficient collaborative intrusion detection algorithm to secure vehicular networks
  - Detection and prevention algorithm for misbehaving intruder in vehicular network and to enhance security against lethal cyber-attacks in UAV networks
  - A Fuzzy Logic-Based Communication Medium Selection for QoS Preservation in Vehicular Networks
  - Content dissemination and synchronisation framework
- New applications:
  - An Itinerary Planning application service for Smart Cities
  - Enhanced automatic vehicle location application with OBU data
  - Adaptive video transmission application

Standardisation
- Contribution to the 3GPP Critical Communications standardisation groups
- Contribution to ITU-T SG13

Patents
- 1 patent on a data synchronisation process