Cooperative Systems: how can community networks improve road safety?

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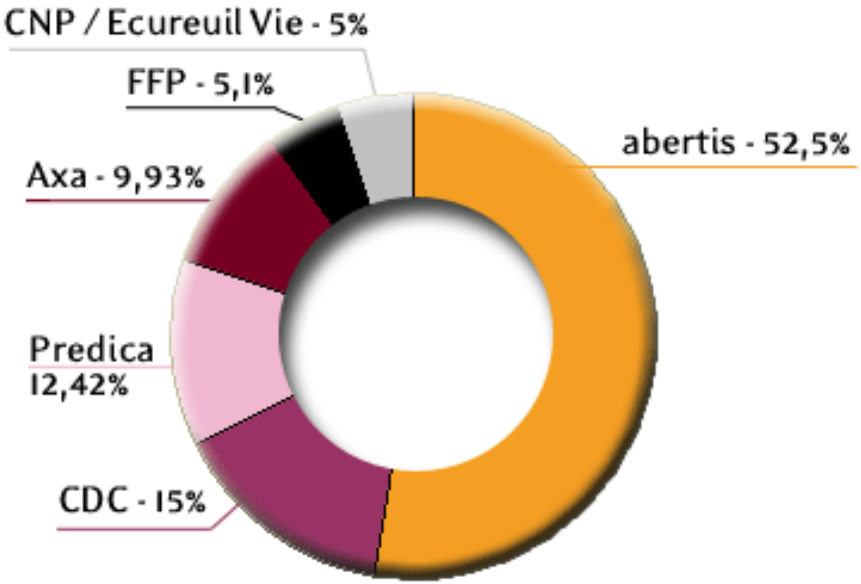
The Sanef Group

- Concessionaire of 2 toll networks, representing 1757 km in operation:
  - Sanef: A1, A2, A4, A16, A26, A29 east
  - Sapn: A13, A14, A28, A29 west
- Participations:
  - Alis (20 %): A28
  - A'liénor (35 %): A65
- Development:
  - Dublin M50: free flow tolling
  - Canada (Vancouver): free flow tolling
  - Slovakia: HGV satellite tolling
  - Airport: Lille-Lesquin
  - Parkings

The Sanef Group

- Key figures
  - Revenue 2009: € 1,414 Md
  - 3 580 employees
  - Investments: € 257 M
  - Green investments: € 250 M over 3 years
- Shareholders (since 2006)



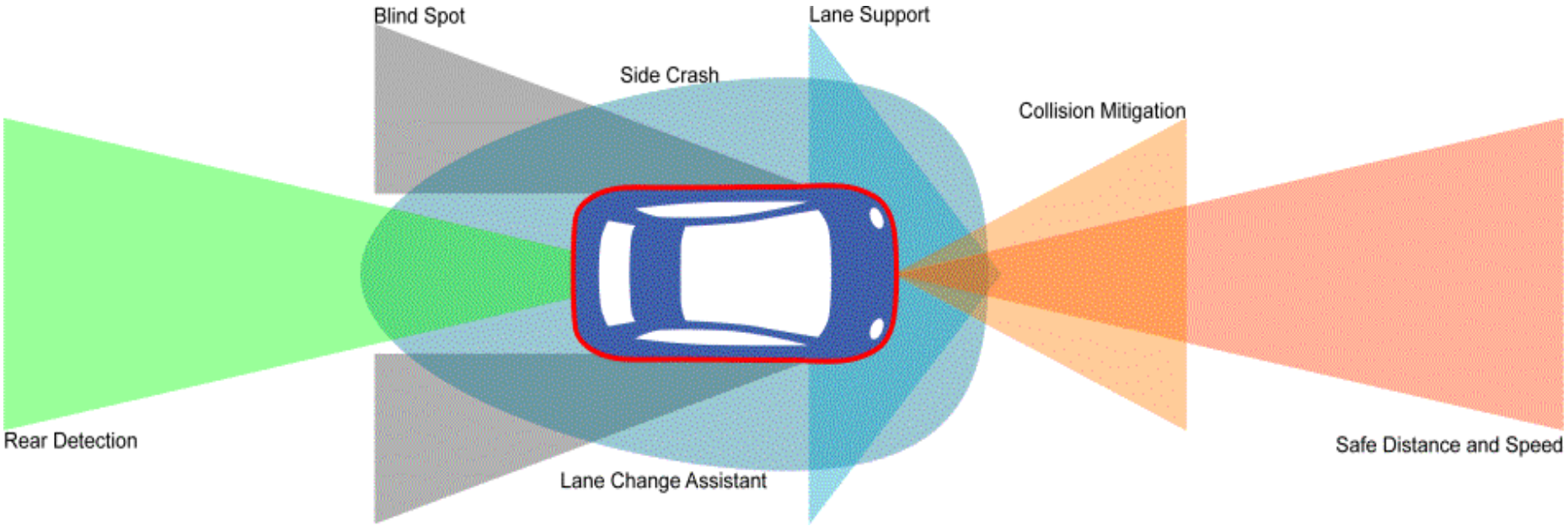
- Network in operation (Sanef + Sapn): 1757 km
- Traffic: 14,6 Md km travelled
- Toll transactions: 270 million / year
- 860 000 toll tags ditributed
- 132 toll plazas
- 72 service areas and 122 rest areas
- 28 operation centres

"Smart Vehicles on Smart Roads"

- To detect in advance potentially dangerous situations and extend, in space and time, drivers' awareness of the surroundings
- To exchange information in real time between vehicles and between vehicles and infrastructure
- To provide warnings and alerts at the appropriate time and location

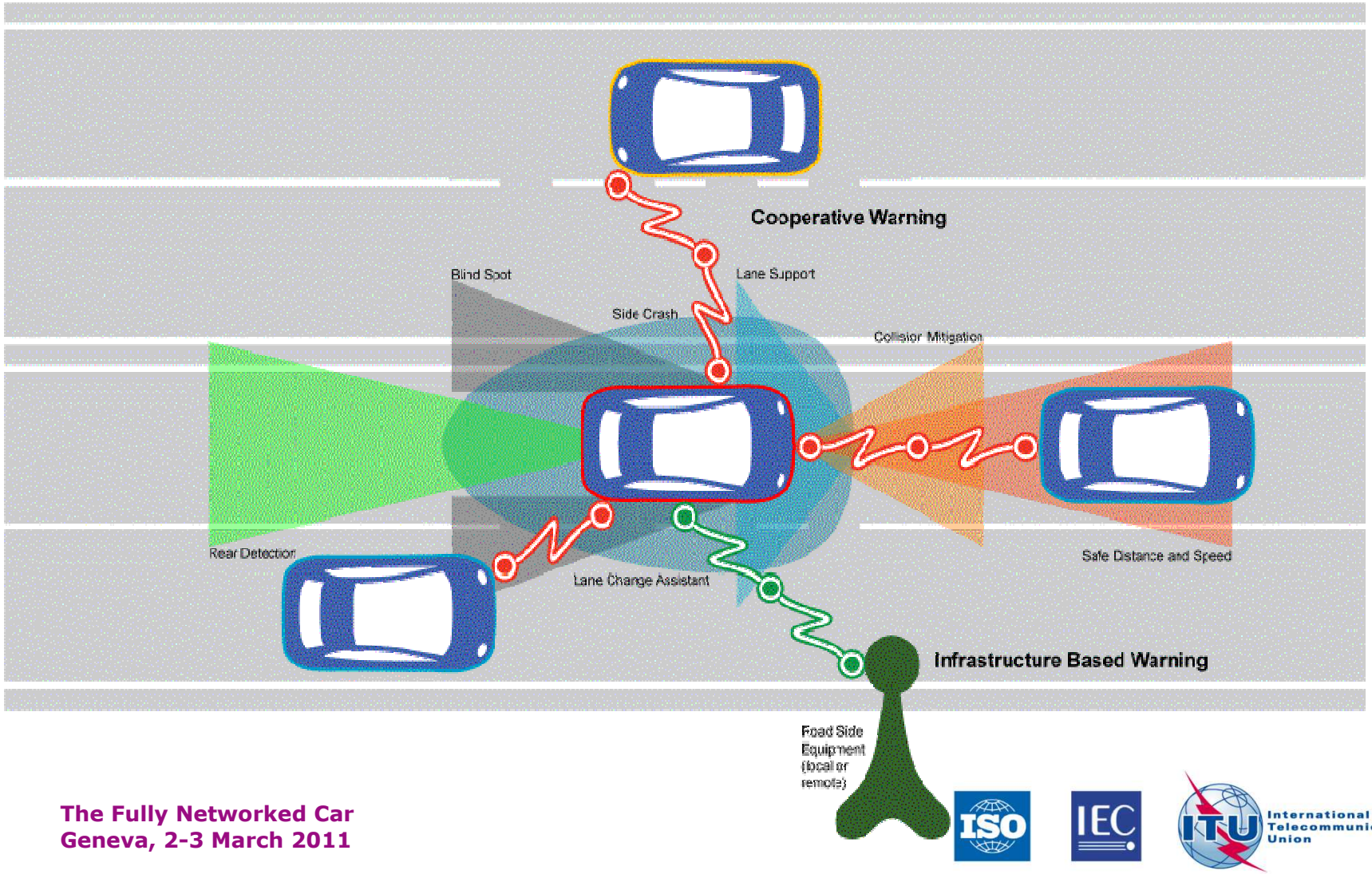
Cooperative Systems (1)

From the autonomous intelligent vehicle…



Cooperative Systems (2)

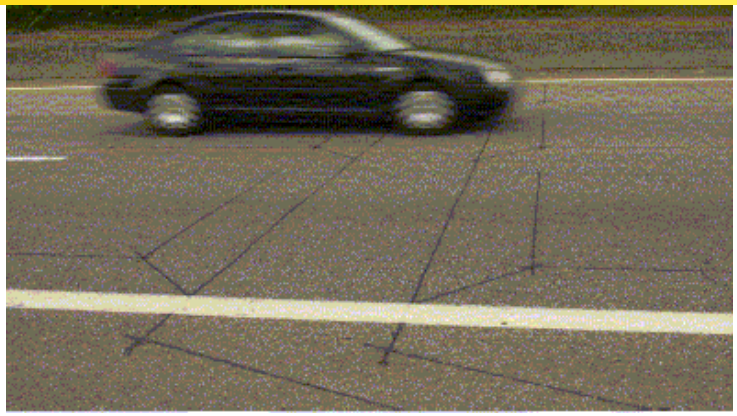
… to intelligent Cooperative Systems



Role of the Road Operators

- Collect traffic, weather and incident data
- Verify, validate and process information
- Inform drivers before their travel and en route
- Warn driver of any potential event on the road
- Protect stopped vehicles and accidents
- Organise or provide assistance services to travellers (towing, ambulance, etc.)
- Maintain and repair the road infrastructure
- Keep the road viable and safe in any condition (weather, traffic)
- Provide the highest (unprecedented ?) safety at any time, any where

Traffic and weather data collection



Traffic counting (loops)

DSRC beacons

Weather stations

IR & Radar sensors

Automatic incident detection

- Detection via video image processing

- Radar detection

Traffic management and control

Traffic Operation Centre

Traffic Information Centre

Information broadcasting -> via radio

Traffic radio transmitters

107.7 FM
la radio des autoroutes sanef

FM / DAB Radio receivers

ISO IEC ITU International Telecommunication Union

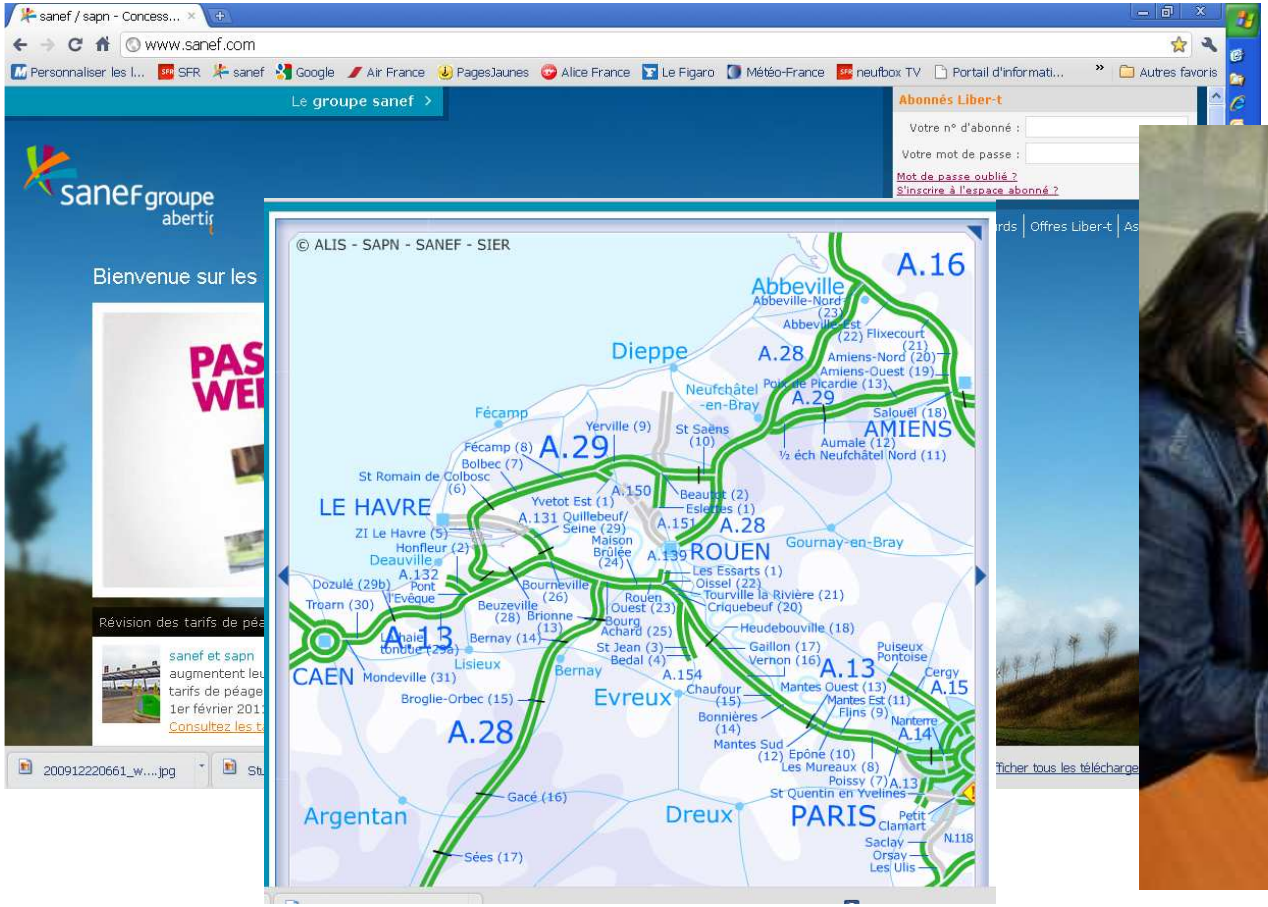
Variable message signs

Warnings, incidents

Safety advices

Travel times

Web traffic & Call centre



Web site: traffic info

www.sanef.com

Call centre: 09 708 08 709

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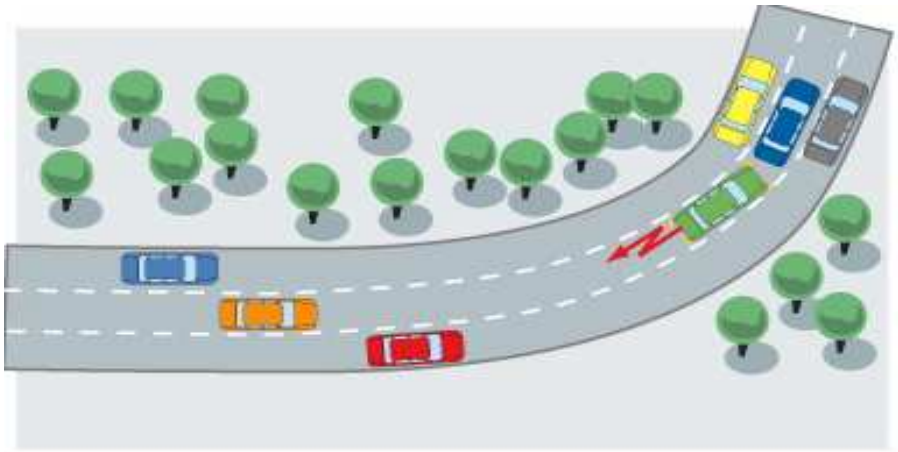
With classic systems

- Road operators keep a constant view over hundreds of Km and have dedicated staff patrolling 24h/24
- With current systems, incident notice is given over radio 3-5 minutes after being detected
- It can take up to 15 minutes before incident is detected!
- Some drivers are not listening to radio or not looking at VMS
- Densification of sensors and display systems is not economically feasible
- Autonomous embedded systems are not sufficient to improve road safety and have a limited horizon (150 m)
- Multiple accidents and pile ups still happen

Why co-operative systems ?

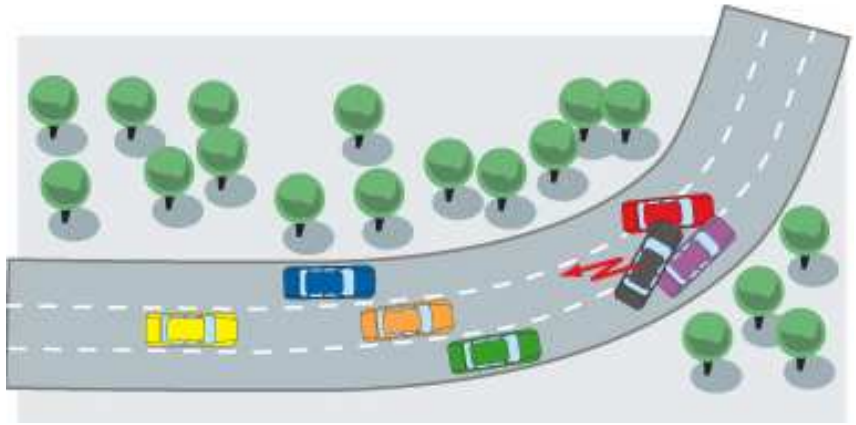
- Vehicles are permanently connected together and with the infrastructure through V2V and V2I networks
- They behave as sensors (XFCD) and receivers of traffic information and incidents
- All hazards can be instantly detected and transmitted to road side communication units (RSU)
- RSU are connected to Traffic information centres, that collect, verify and process information from different sources
- Warnings are sent instantly to vehicles upstream
- Drivers can reduce their speed, change lane, anticipate any obstacle
- Horizon is increased from a few 100 m to a few KM minimum
- Detection, processing and warning take only a few seconds

Examples of Hazard & incident scenarios



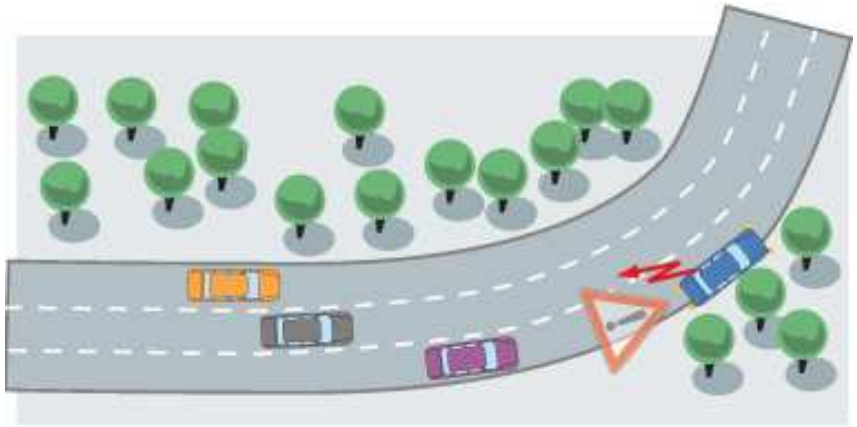
1) Traffic jam

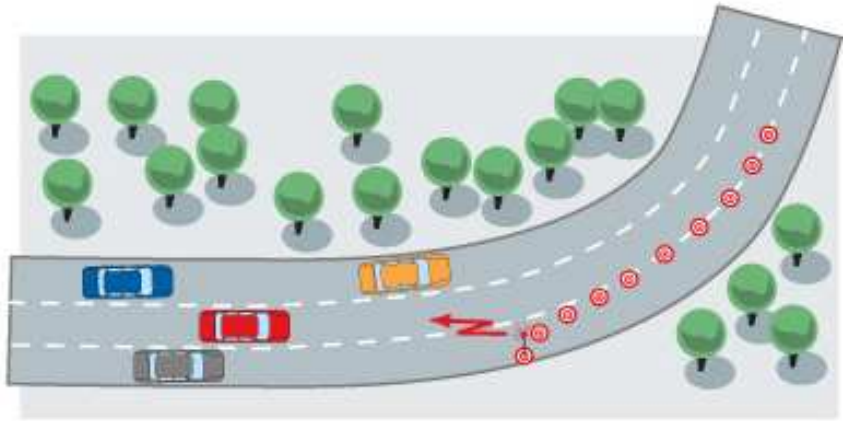
3) Stopped vehicle



2) Accident

4) Road works





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Contribution of community networks

- “Coyote system” or iCoyote apps on iPhone
- Initially developed for speed radars warnings
- Drivers are witness of incidents and can report them to the community
- Events are geolocated
- A central system processes and distributes the warnings
- Confidence is given by the number of reports

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Future mobility services

- Safety applications on smart phones
- All drivers contribute to and benefit of incident reporting
- Road operators are informed as well

Mobile application of ASF