

SAFE ROAD TRAINS FOR ENVIRONMENT

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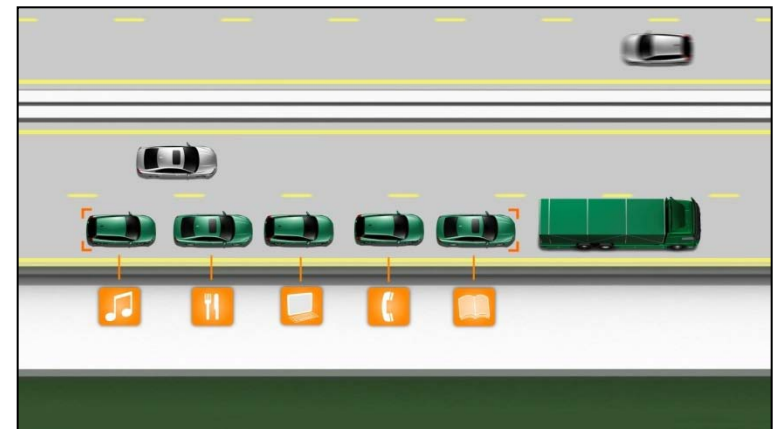
The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 233683.



SARTRE is an EU FP7 Project



- Call Identifier: FP7-SST-2008-RTD-1 Sustainable Surface Transport - Activity: "Encouraging step changes / radical technology changes"
- Objectives:
 - Define a set of acceptable platooning strategies that will allow road trains to operate on public highways without changes to the road and roadside infrastructure
 - Enhance, develop and integrate technologies for a prototype platooning system such that the defined strategies can be assessed under real world scenarios (5 vehicle platoon demonstrator)
 - Show how the use of platoons can lead to environmental, safety and congestion improvements
 - Illustrate how a new business model can be used to encourage the use of platoons with benefits to both lead vehicle operators and to platoon subscribers
- Programme started 1st September 2009
 - Due to complete October 2012
- €6.4 million funding of which the EU contribution is 60%





An Opportunity

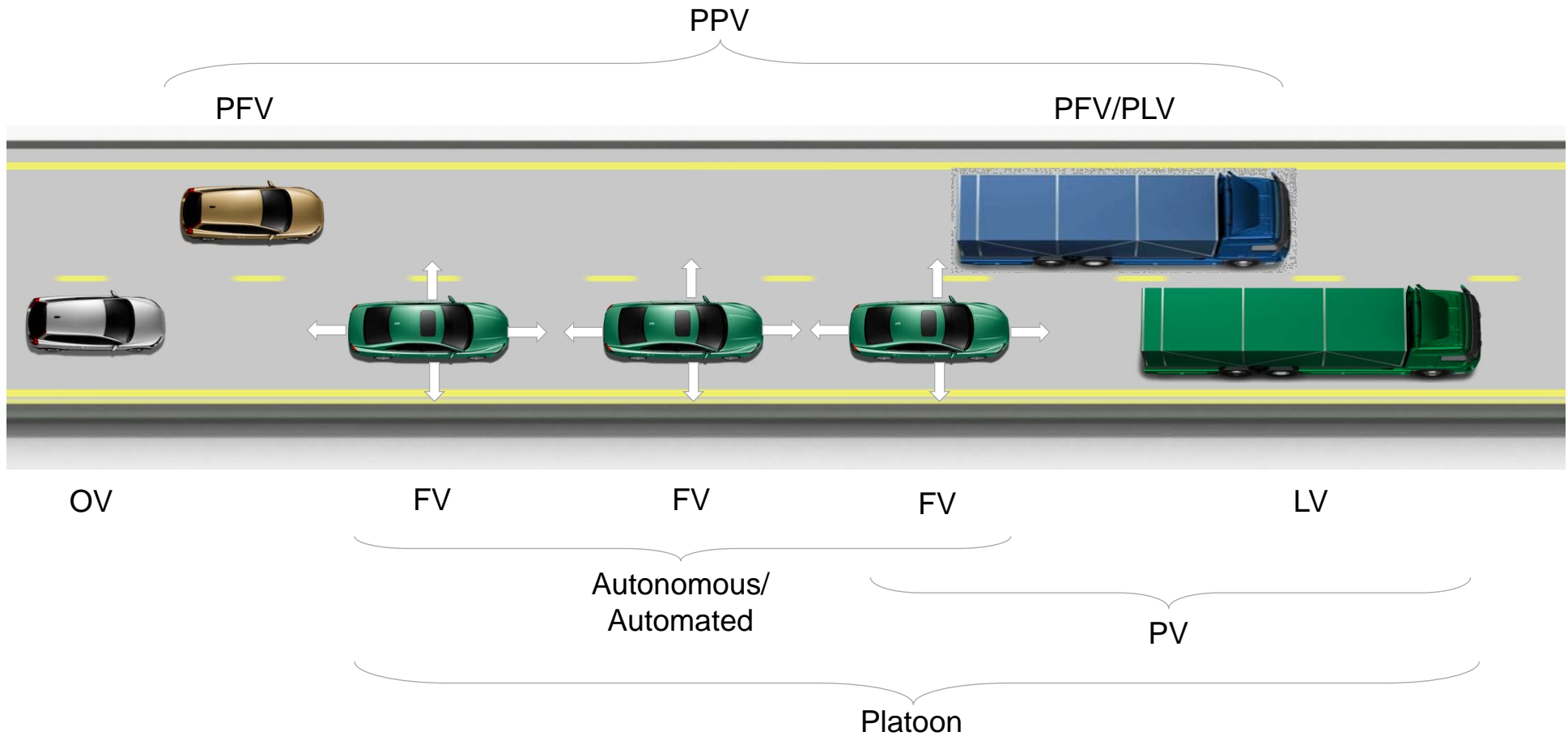


- Safety improvements from autonomous control
 - Drivers contribute to 87% of road fatalities
- Congestion improvements from smaller time gaps and autonomous control
 - Delayed traffic collapse
 - Reduced traffic dynamics
- Fuel improvements from reduced drag
 - Minimise distance between vehicles for maximum improvement
- Additionally - Improved Driver Convenience





A Number Of Terms



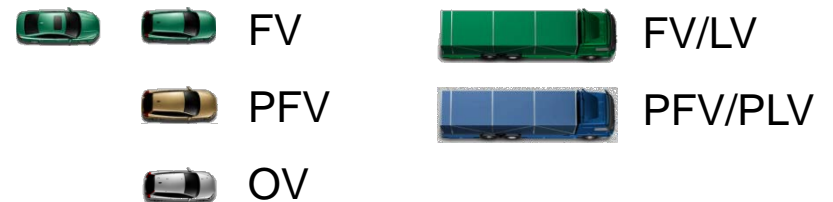
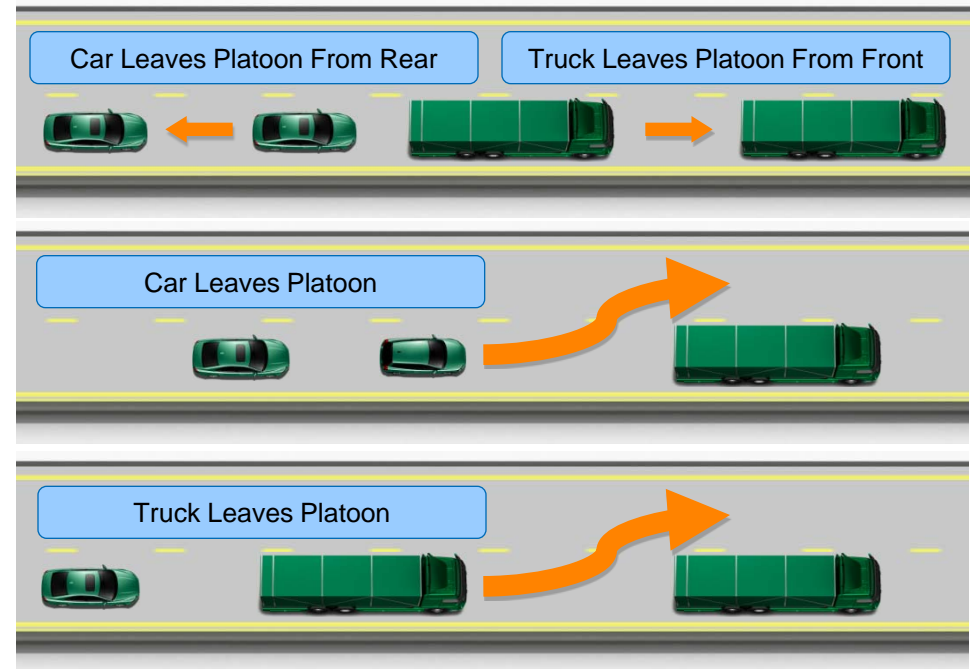
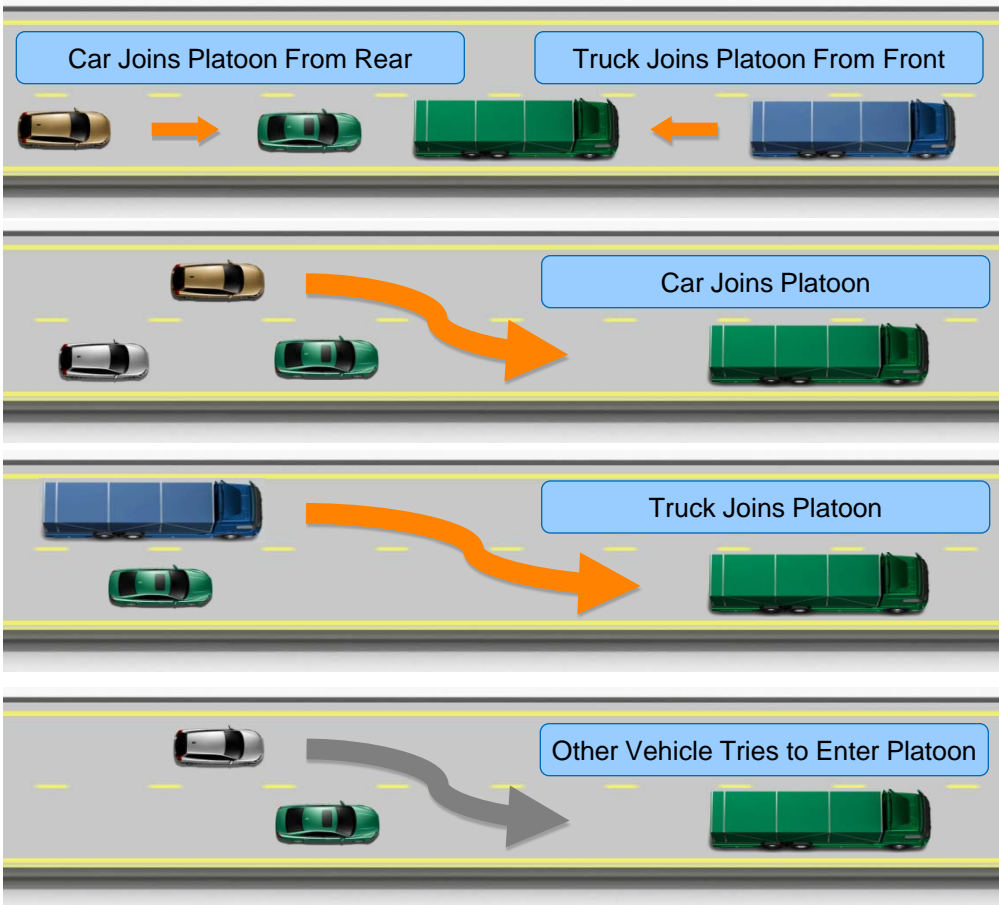
Other Vehicle (OV)

Potential Platoon Vehicle (PPV) = Potential Lead Vehicle (PLV) OR Potential Following Vehicle (PFV).

Platoon Vehicle (PV) = Lead Vehicle (LV) OR Following Vehicle (FV).



A Number Of Use Cases





Following Vehicles HW



- We used an S60, V60 and XC60 and have reused as much as possible.
- Vehicles will be equipped with:
 - S60 radar and camera
 - Closing-velocity sensor (City Safety)
 - Rear and side-looking radars
 - V2V communication unit
- Reused engine and brake interfaces from ACC
- For steering a (prototype) EPAS gears
- Dedicated HMI (incl. Seat vibration)



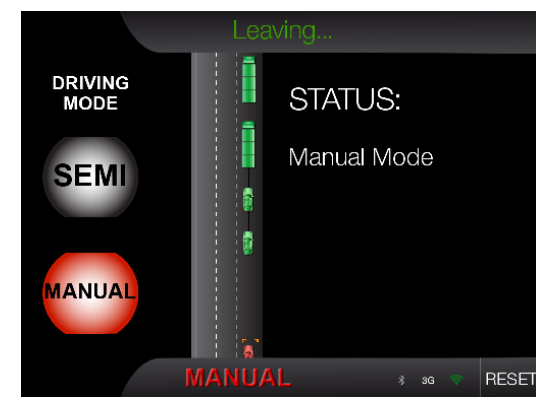
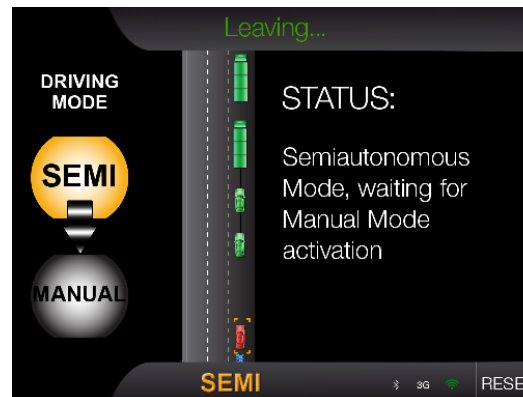
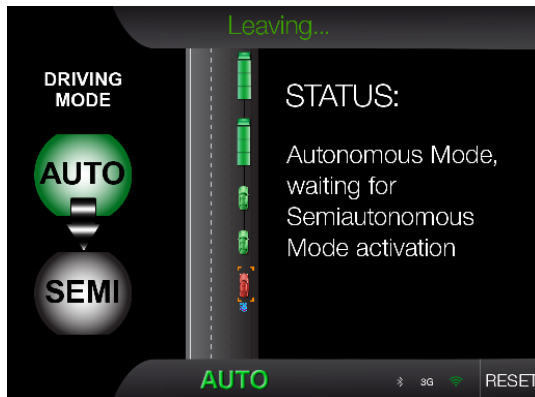




Some Outcomes - HMI



- Look-ahead camera
- Platoon status
- Mode transitions

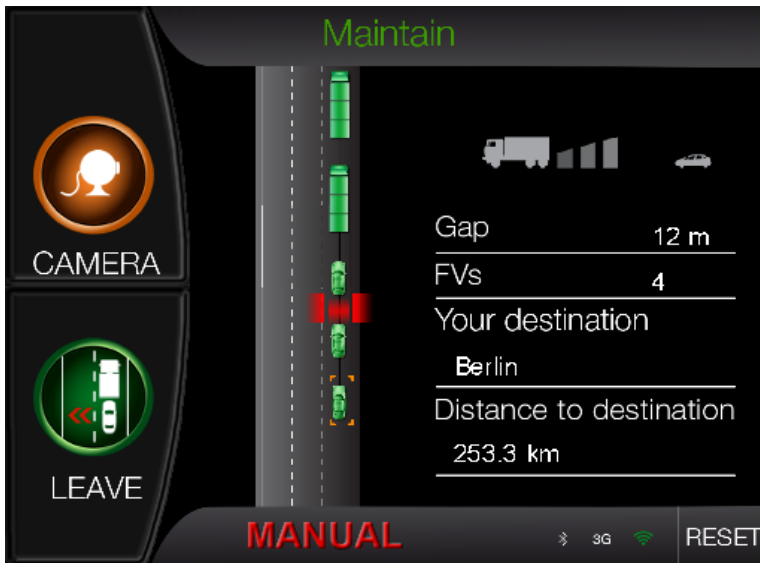




Some Outcomes - HMI



- Other vehicle detection
 - Within platoon
 - In adjacent lanes





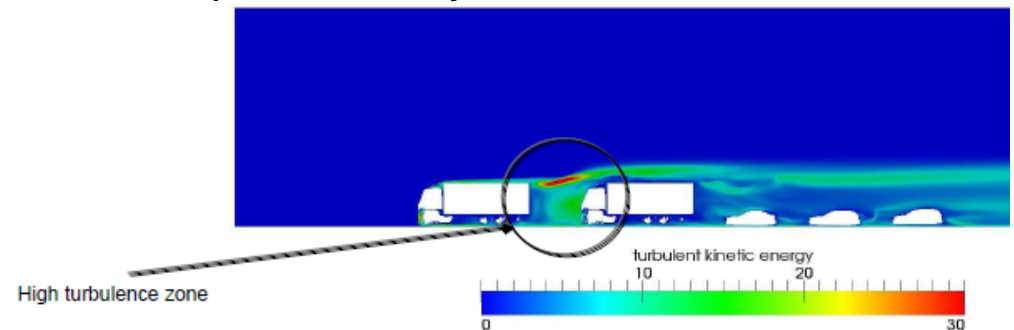
Some Outcomes – Fuel Consumption



GAP vs %



- Preliminary results indicate increased fuel consumption at very short distances:
- Effects of turbulence?
- Effects of control strategy?





Some Outcomes – Lessons Learned



- Short distances:
 - Gravel – stones damaging vehicle
 - Salt spray
 - Driver perception

- Minor lateral oscillations
 - Look-ahead control

- Issues with direct sunlight in camera

- HMI complexity



Remaining Challenges



- Driver override
 - Allow driver to always override and leave the platoon without prior agreement?

- Lane change
 - LV first others follow?
 - All together?
 - FV first then others?

- Unresponsive FV driver
 - Platoon pull over to hard shoulder (or slip road) and dissolve leaving unresponsive vehicle behind?
 - LV driver to check FV driver?



Remaining Challenges



- Functional Safety (ISO 26262) – how to deal with faults – this affects the entire vehicle.
- Verification – how much verification is needed before we can drive highly/fully automated?

