FILS
Master in Software Engineering
Course: Software Design Techniques
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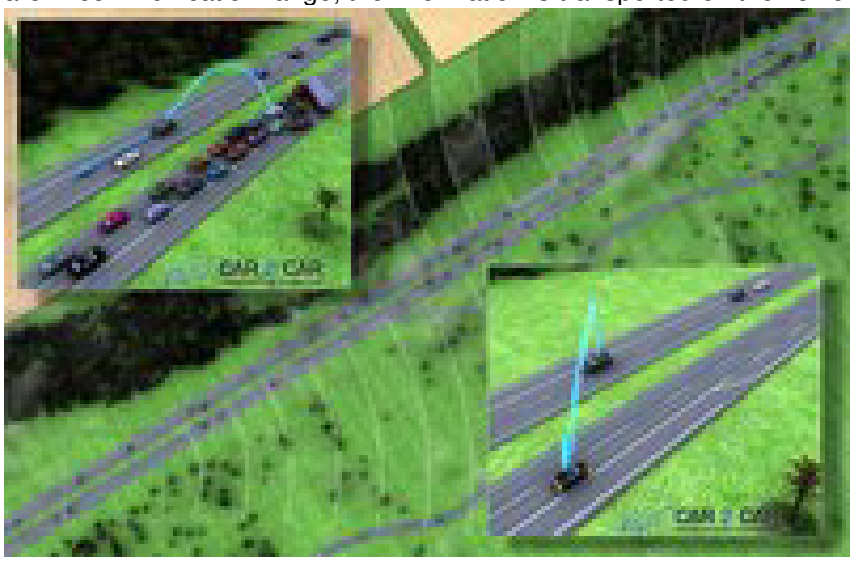
Homework #9
Internet of Things

With the objective of further increasing road traffic safety and efficiency a Cooperative Intelligent Transport Systems (C-ITS) with Vehicle-to-Vehicle Communication (V2V) supported by Vehicle-to-Infrastructure Communication (V2I) is proposed. In order to develop C-ITSs several use cases were proposed. Such a system is **SOTIS**.

A **Self-Organizing Traffic Information System (SOTIS)** uses Car-2-Car Communication (P2P) to collect information on the local traffic situation at very low equipment rates. With SOTIS vehicles gather information such as *average velocity* for all driven road segments. This information is exchanged between vehicles by *IEEE 802-11P based wireless communication* (Situation 1). Cars heading towards a traffic jam are informed by the opposing traffic (Situation2). By analyzing the average velocities on the upcoming road the cars can detect an obstacle or traffic jam and avoid it by rerouting. Traffic jams on the alternating route can be detected and avoided as well. In situations where no other vehicles are in communication range, the information is transported on the vehicle board.

Situation 1



Situation 2

Let consider only highway scenarios. In such scenarios an up-to-date traffic analysis for a local area of 50-100 km can be obtained even if only 1-2% of all vehicles are equipped with the ad hoc P2P communication system. The simulation results indicate that comfort applications are robust against communication errors on the lower network layers.

Use case: Avoidance of traffic jams in highways (Example of V2V Communication)

Let the case of 3 cars that are equipped with SOTIS communication systems. According to this scenario the car A receive in a P2P manner from the car B that runs in the opposing direction traffic, information on the B's average velocity. If the sent information indicates a very low velocity or even a halting state A is able to detect a traffic jam and register this event on board. Later, when A identifies the car C on the alternating route (that is in the same route of A) is able to inform it regarding the traffic jam.

Constraint: the SOTIS architecture is compliant with the IoT reference architecture.

Requests

1. Identify the intelligent "things" in this scenario.
2. Identify some devices, sensors and actuators needed to implement the scenario.
3. Draw an interaction diagram for this business scenario that contains Situation 1 and Situation 2.
4. Draw interaction diagrams (or alternatively information flow diagrams) for the software scenarios corresponding to the behavior of the cars A and B in the Situation 1. The diagrams will involve the components in the SOTIS layers (according to the IoT reference architecture) of the two cars.