Circulating personal cars reach the 15 millions per day in Paris, including its suburban area. Moreover, each individual vehicle is occupied in average by less than 1.3 person. This situation leads naturally to traffic jams, pollution, time loss, stress... and is not specific to Paris since all big urban areas around the world are also confronted with such a problem. Several scientific approaches can be considered so as to partially solve this problem. Among them, one can cite those based on the “platoon” function, which allows vehicles to follow each other automatically without any material coupling. Thus, vehicle platoon can be defined as a set of vehicles, that moves autonomously together while keeping a defined configuration. The most widely used platoon configuration is the column, also known as train configuration, where vehicles are placed one behind the other. Applied to highway or to urban areas, this platoon function allows reducing the inter-distance between vehicles while keeping safety properties. This leads to an increase in road capacity and to an improvement of traffic flows. Over the last two decades, many projects, such as PATH, CRISTAL, SARTRE, SafePlatoon have dealt with platoon issue in order to increase the traffic safety and efficiency on urban area and highways. Another possible approach consists in developing smart crossroads aimed at improving the efficiency of the classical traffic light of stop sign intersection. Many approaches dealing with this issue can be found in literature. Among them, one can cite the methods based on the control of the light cycle depending on the perception of incoming vehicles, traffic-responsive strategy based on the vehicle-interval method, or methods based on vehicle to infrastructure wireless communications.

The purpose of this PhD thesis is to study, develop and test new approaches so as to tackle with the traffic jam based on platoon function and on crossroads considered as smart hubs where trains of vehicles can cross and exchange vehicles with efficiency. The subject of this PhD has to take into consideration several levels of the problem from the local point of view, dealing with the perception and communication issues between vehicles (V2V) and with the infrastructure (V2I), to the system point of view where one want to optimize the travel time of vehicles. For each level, the candidate will have to define measurements so as to evaluate with pertinence his proposals.

The candidate will benefit from the experience of IRTES-SeT laboratory researchers on platoon systems (European FP7 CATS Project, FCE/FUI National CRISTAL Project, ANR SafePlatoon French National Project). This work will be made both in simulation using the tools developed in IRTES-SeT laboratory such as VIVUS (http://www.vivus-simulator.org), and with IRTES-SeT mobile vehicles (http://www.multiagent.fr/IntelligentVehicle_Platform).

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**References:**
