Université de Technologie de Compiègne – Thesis proposal

Thesis proposal title	**Protocols and algorithms for vehicular architectures in smart-cities**
PhD grant	Doctoral work contract based on a Ministry of Research Grant
Research laboratory	Research unit: UMR UTC CNRS Heudiasyc n°7253 research team: Réseaux & Optimisation web site: https://www.hds.utc.fr
Thesis supervisor(s)	Prof. Bertrand Ducourthial
Scientific domain(s)	Computer science and information technologies Science and technology
Research work	Since several years, dynamic ad hoc networks (such as vehicular networks) are studied in the Heudiasyc laboratory. Such networks are characterized by unstable neighborhoods, challenging protocols, algorithms, architectures, security frameworks... These studies take part to the MS2T Labex dedicated to the control of technological systems of systems (http://www.utc.fr/labexms2t). A system of systems is characterized by the interactions between autonomous systems. Vehicles interacting with others and with the city infrastructure (sensors, road-side-units...) constitute an emblematic case of system of systems. This PhD aims at exploring the relations and mutual contributions of vehicular networks in one hand and smart-cities for the other hand. Our preliminary experiments showed that • Vehicles can take advantage of information given from sensors through road-side-units. We showed by instance that information about icy roads can be determined by vehicles using distributed algorithms implemented both in road-side-units and vehicles and fed by data sent by sensors even unreliable. Such a technique is more reliable than a classic alert diffusion. • Vehicles can carry information from some sources in the city up to a destination. Such an architecture is cheap and avoid to multiply the connections towards Internet for each sensor in the city. Among possible directions, the candidate will explore distributed architectures in opportunistic networks, data gathering and data diffusion strategies, transport protocols (including new technologies such as VLC) and security solutions. Recent standards are also to be studied and experimented (IEEE 802.11p, OSI CAM and DENM...). All such directions are able to improve the current solutions from the state of the art and the candidate will explore some of them. Theoretical and/or practical studies are expected, using road tests and network emulation thanks to the tools (hardware and software) designed previously in the lab. Following a European Celtic Plus project, a convention has been signed with the city of Compiègne for experimenting some applications for smart cities relying on vehicular networks. Moreover, a project with the City of Amiens is devoted to the data gathering using vehicles.
Key words	Vehicular networks, smart-cities, distributed algorithms, networking, experimentation
Requirements	The candidate must demonstrate (through her/his formation, previous projects, recommendations, grades) excellent skills in computer science. We are seeking candidate mastering either in networking, distributed algorithms, sensors, embedded systems. A taste for the development and experimentation will be a plus.
Starting time	October 2016
Location	Université de Technologie de Compiègne