

## Scientific Report

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Nationality	Fr
Name of the <i>Host Organisation</i>	CNR
First Name / family name of the <i>Scientific Coordinator</i>	Marco Fiore
Period of the fellowship	01/04/2015 to 31/03/2016

### I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my fellowship, I focused my research on vehicular network communications capabilities. I also kept interest in distributed computing, my main research area. Both activities lead to publication during the year, but for the sake of brevity I will just describe here the work done with Marco Fiore at CNR, which is analyzing experimentally the power of store carry and forward mechanisms in vehicular networks.

The main question we asked ourself in this collaboration is whether current analyses of this kind of communication is pertinent or not. Analysis of vehicle to vehicle communication starts with understanding the evolution of the connectivity, which is the amount of vehicle a given vehicle could send a message to if it wanted to. Understanding connectivity is essential for designing vehicle to vehicle communication algorithms. Until today, every research on this subject we are aware mainly focus on analysing real network and mobility datasets in order to understand the underlying vehicle connectivity. The techniques used varies, but they all have the same drawback. They all use an aggregated view of the connectivity: vehicle A is considered to be connected to vehicle B if they share a direct communication link at any moment in time. Nevertheless, all these

approach to this problem do not consider multi hop communication: vehicle A could send a message to vehicle B via a third vehicle, C. This would obviously require that vehicle C can store the information A needs to send to B for some amount of time. This kind of communication mechanism is usually referred by store carry and forward. Our goal was to observe what is the impact on the connectivity if we observe not only direct communications but also multi hop communications. In this model, vehicle A is connected to B if it exists a temporal path from A to B using several one-hop communication over time. We used our complementary knowledge to propose an accurate analysis of existing mobility datasets. Our results showed that using carry-forward greatly increase connectivity especially in very sparse networks. Moreover, these results showed that using carry-forward mechanisms in order to share pieces of information within a given geographically-delimited area could be very efficient, i.e., new entering vehicles could be reached rapidly.

## II – PUBLICATION(S) DURING YOUR FELLOWSHIP

### Journals:

- **Submitted** C. Glacet, A. Miller, A. Pelc. Time vs. Information Tradeoffs for Leader Election in Anonymous Trees. *ACM Transactions on Algorithms (TALG)*.
- **Submitted** C. Glacet, N. Hanusse, D. Ilcinkas, C. Johnen Disconnected components detection and rooted shortest-path tree maintenance in network. *Journal of Parallel and Distributed Computing (JPDC)*.
- **2016** C. Glacet, N. Hanusse and D. Ilcinkas. The impact of dynamic events on the number of errors in networks. *Theoretical Computer Science (TCS)*, ISSN 0304-3975.

### Conferences with proceedings:

- **2016** C. Glacet, A. Miller, A. Pelc. Time vs. Information Tradeoffs for Leader Election in Anonymous Trees. 17th ACM-SIAM Symposium on Discrete Algorithms (**SODA**), pages 600–609. **A\***
- **2015** C. Glacet, M. Fiore, M. Gramaglia. Temporal connectivity of vehicular networks: The power of store-carry-and-forward IEEE, 7th Vehicular networking conference (**VNC**), pages 52–59.
- **2015** C. Gavoille, C. Glacet, N. Hanusse and D. Ilcinkas. Brief Announcement: Routing the internet with less than fifteen entries 34th ACM Symposium on Principles of Distributed Computing (**PODC**), pages 33–35. **A\***

### **III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES**

#### **Conferences:**

- 17eme Rencontres Francophones sur les Aspects Algorithmiques de Télécommunications (AlgoTel)
- Twenty-Seventh Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2016
- IEEE Vehicular Networking Conference, VNC 2015
- 2015 ACM Symposium on Principles of Distributed Computing, PODC 2015

### **IV – RESEARCH EXCHANGE PROGRAMME (REP)**