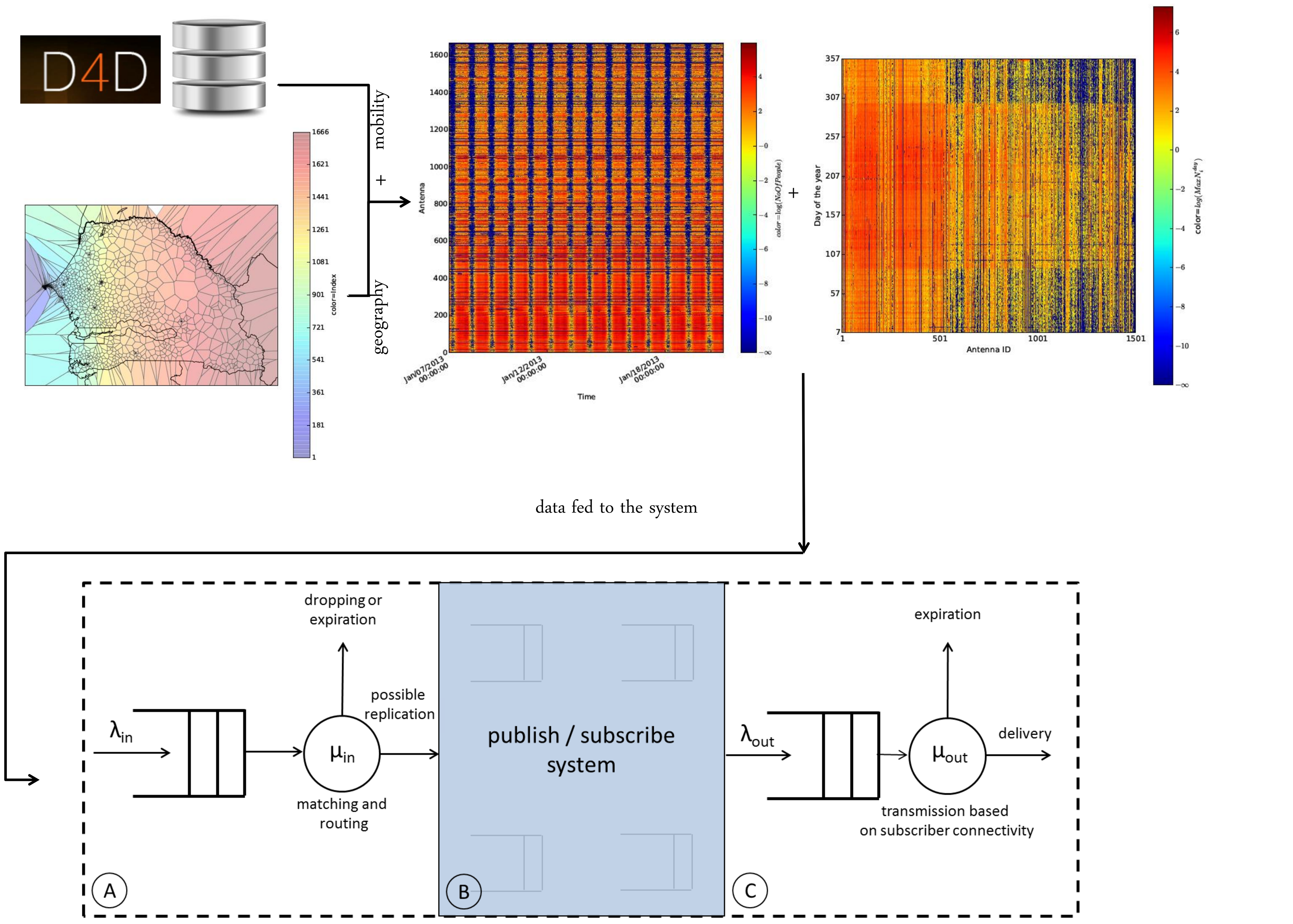
Towards Mobile Social Crowd-Sensing for Transport Information Management

Health	Transport Urban	National Statistics	Other
Agriculture	Energy	DataViz	Network



Project Summary:

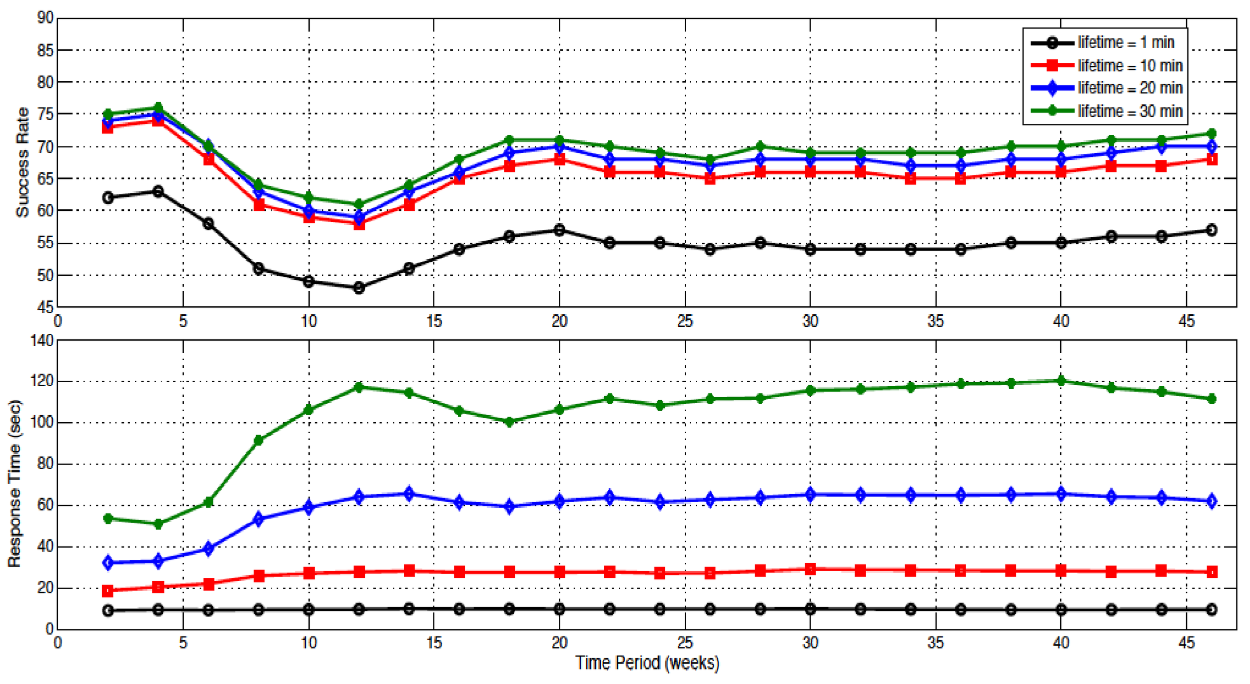
Transport in Senegal is chaotic and large, especially in main cities. Additionally, although most people have mobile phones, large part of them still rely on SMS. Considering this, we propose the development of an application platform for large-scale transport information management relying on '*mobile social crowd-sensing*'.

To support this platform, we model a large-scale mobile *publish/subscribe* system using *queuing theory*. We develop *MobileJINQS* simulator that uses *D4D data* for parameterization.

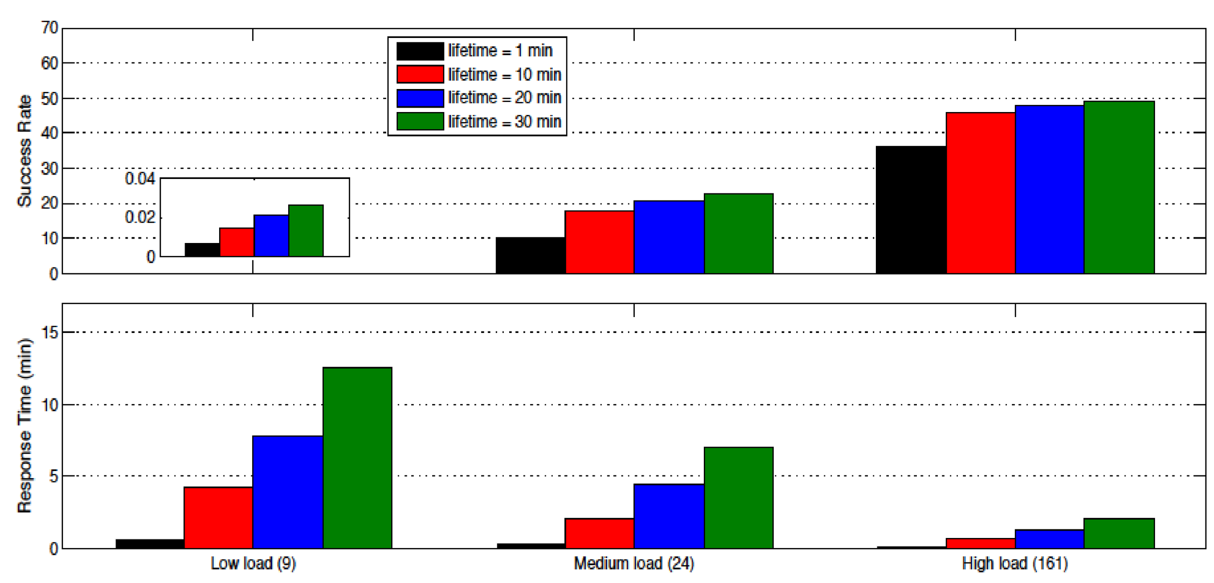
Possible use for development:

The project provides telecom providers insights to fine tune the communication backbone, and application developers a platform for transportation application.

- Bouloukakis, Georgios, PhD Student
- Georgantas, Nikolaos, Research Scientist
- Agarwal, Rachit, Post Doc
- Pathak, Animesh, Research Scientist
- Issarny, Valérie, Senior Research Scientist



Success rates and *Response times* for network traffic from low load Antenna 9 to high load Antenna 161 with varying message *lifetime periods*



Mean end-to-end transaction *Success rates* and *Response times*

Main results:

- High load observed in antennas near Dakar.
- Varying incoming loads and service delays has a significant effect on response time.
- Success rate and response time are directly proportional to message lifetime with proportionality constant greater for response time.
- Response time is dependent on subscribers behavior.

By properly setting event lifetime span, system or application designers can best deal with the tradeoff between the *freshness of the information* and the *information delivery success rate*. Still, both of these properties are highly dependent on the dynamic correlation of the (intrinsically decoupled) *event input flow* and *delivery flow* processes.

Method:

- Let N^t_i be the number of people in an antenna i at a given time t over the period of the trace (50 weeks)
  - Let λ_{in} be the input process at the input access point associated to the antenna i, then λ_{in} is a non-homogeneous Poisson process with rate $\lambda(t)=N^t_i / |t|$. Similarly μ_{out} is a non-homogeneous Poisson process with rate $\mu(t)=N^t_j / |t|$ at the output access point associated to the antenna j.
  - μ_{out} is equivalent to service time that follows an exponential distribution with mean equal to $1/\mu(t)$.

Full paper is at:

http://xsb.inria.fr/docs/d4d2015.pdf

DataViz or video are at:

http://xsb.inria.fr/d4d#visualization

Data sources used for this project:

- D4D data set 1, communication between antennas ☐
- D4D data set 2, high resolution movement routes ☒
- D4D data set 3, low resolution movement routes ☐
- D4D synthetic data set ☐

Other data sets used in this project:

- None

Main Tools used:

- XSB
- MobileJINQS
- Queueing Theory
- Python `mpl_toolkit`

Open Code available:

- Yes ☒
- No ☐