Autonomous radio system for traffic lights priority management

- Calls triggered by self location in location zones
- Configuration of the location zones using PC Prio-Utility software
- Radio data network at the depot to download the database in buses and to collect bus event logs
- Verification of the effective crossing times and statistics using the Prio-Stat software module
- Approved by several manufacturers of traffic lights controllers
- Compatible with the French STIF recommendation

PRIOCOM System

Presentation:

PRIOCOM is a complete system of request for priority to traffic lights intended for urban transport means or emergency vehicles. It makes it possible to accelerate crossing times at the crossroads and to increase the global speed of the buses or tram while making reliable the respect of the schedules.

This system relies on radio communications between a calculator embedded in the vehicles and the traffic lights controllers. It is particularly fast to install and does not require any road work.

It consists of a data-processing central station, **PC Prio-Utility**, which is used to create the data bases needed by the **LCU-Prio** calculators that are embedded in buses.

This central station also controls the consistency of crossing times at the crossroads and authorises adjustments of the system if drifts are detected.

A radio data network is used at the depot to download the data bases into the buses and collect their event logs.

Operation:

The embedded calculator **LCU-Prio** automatically sends the requests for priority when the bus comes near a crossroads. It stores the courses, the location zones and the procedures of approach for each traffic lights controller and takes many criteria into account: state of service, time to schedule, priority, direction of the bus...

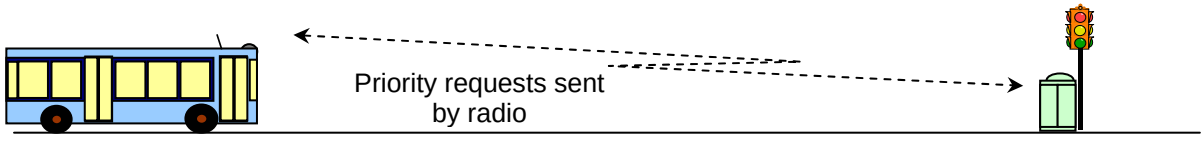
It makes use of an embedded GPS receiver and possibly the vehicle's odometer to calculate the position of the bus.

Traffic lights controllers are also equipped with a radio modem **CRT-Prio** for radio data exchanges with buses according to the French STIF recommendation.

The **PRIOCOM** system can operate in a full autonomous mode or associated with an existing AVL or RTPI system.

The time to schedule of the bus and the activation of the priority requests can be indicated to the driver

The **LCU-Prio** calculators can be later upgraded to support AVL and RTPI functions, and to supervise bus equipment such as: vocal announcement system, passenger information signs, video surveillance system, ticketing machines…



Description:

On board equipment:

LCU-Prio consists of a CPU board in charge of the processing and the data transmission, a GPS receiver and a radio modem. It is able to operate in various frequency bands and hierarchically exploits concepts of course, priority procedure at crossroads and location zone. The on board data base includes:

- the description of all the different courses that the buses can follow ;
- for each course, the chronological sequence of priority procedures to be run according to the crossroads to be crossed ;
- and for each priority procedure, the description of the location zones, distances and crossing times.

LCU-Prio dialogs with the traffic lights controllers by DIASER messages sent by radio according to French STIF specifications. The requests for priority are built by the buses according to their configuration (on board data base) and the real time information at their disposal (GPS position, advance/delay,…)

A priority procedure at a crossroads is composed of 3 steps:

- Detection of the entry in the first location zone and transmission of the priority request message
- Follow-up of the real approach of the vehicle
- Detection of crossing and transmission the priority ending message

In the event of proximity of crossroads a bus can chain several priority procedures. Each crossroads can also simultaneously support priority procedures for several approaching buses.

The data bases, event logs, parameters of operation and the application software are downloadable by radio without need to work directly in the buses.

Traffic lights equipment:

CRT-Prio is a radio modem which uses the same material resources as the **LCU-Prio** product without the location functions.

The product is intended to be installed in a case. The antennas can be left inside the case if it is made of plastic or put on the top using a coaxial cable.

The configuration parameters and the software of the modem can be downloaded by radio without having to open the case.

Central station:

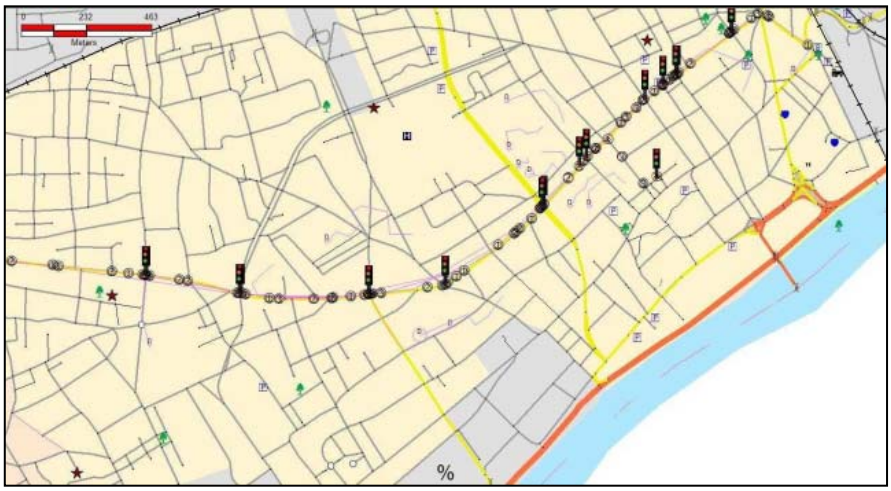
PC Prio-Utility is a data-processing software based on a Geographical Information system and running on a PC. It is used to determine, by manual drawings or imports of data logged by a bus in monitoring mode, the co-ordinates of location zones on the path of the bus to the crossroads and to associate it necessary information.

The transmission towards the buses of all this information and their automatic updates are ensured at the depot by a radio network made up of a **RDC** server (Radio Data Controller), a **FTS** module (File Transfer Service) and of one or more **RFU** (Radio Front-end Units).

The same radio network ensures the collection of the history data in each vehicle at the end of the day.

Prio-Stat is an additional software product used to build statistics. It makes it possible to draw the effective curves of approach carried out by the buses and to compare them with the ideal model to refine the parameter setting. A great number of sort keys is possible.

PC Prio-utility can be run on a remote station connected to the radio data network at the depot using a TCP/IP connection.



PC Prio-Utility

Example of parameter setting of a course with several priority procedures

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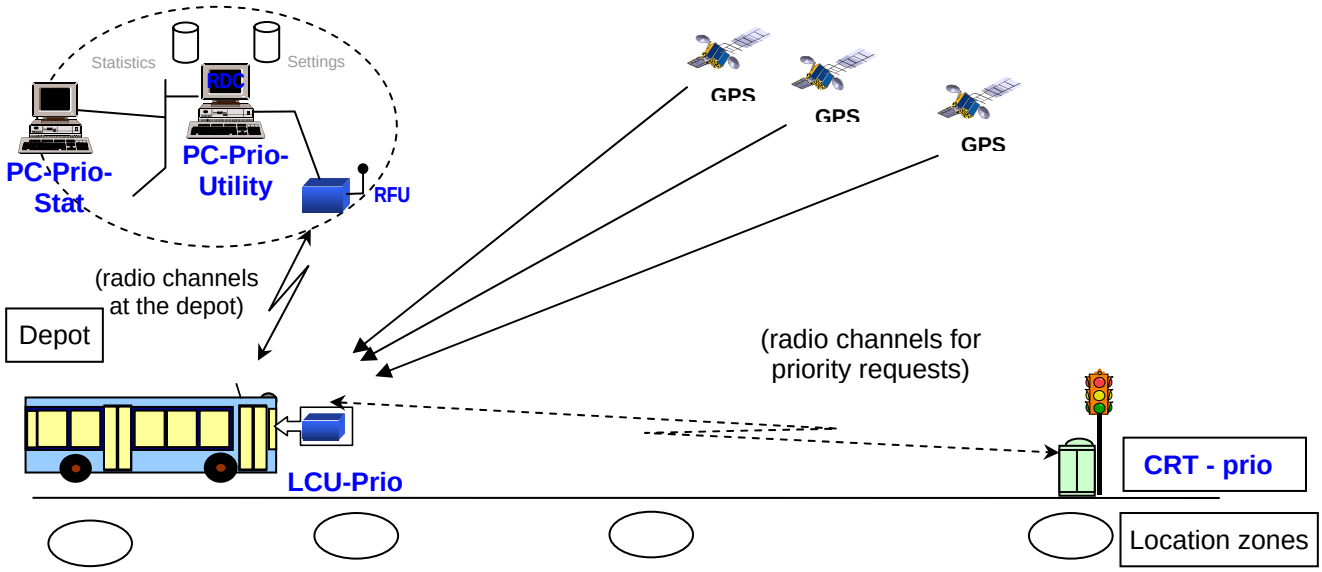

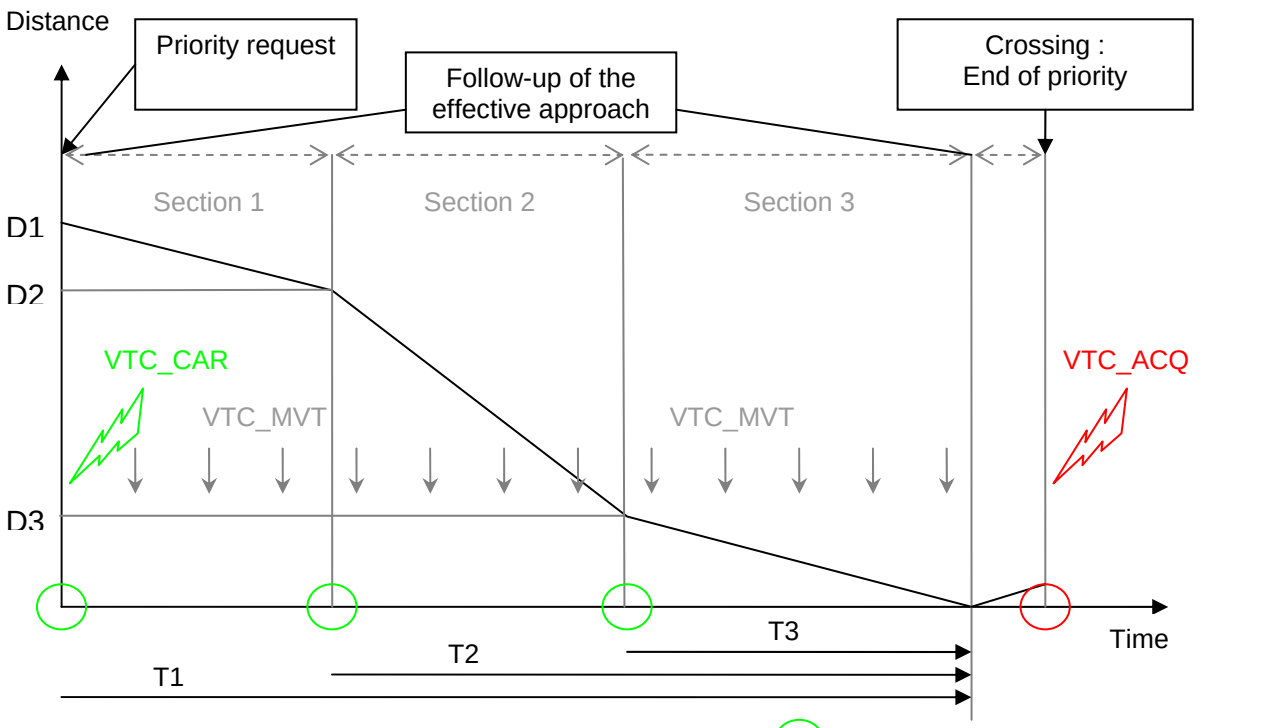

D*n* : Distance to crossroads from beginning of section *n*

T*n* : Time to crossroads from beginning of section *n*

Location zone starting a new section

Location zone after crossing

Priority request procedure
in approach of a crossroads

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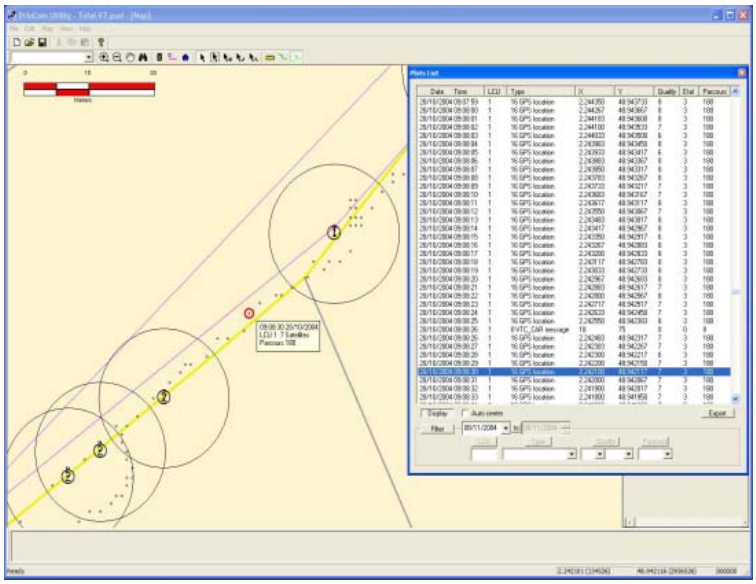
Initial parameter setting and determination of theoretical profiles of approach with PC-Prio-Utility

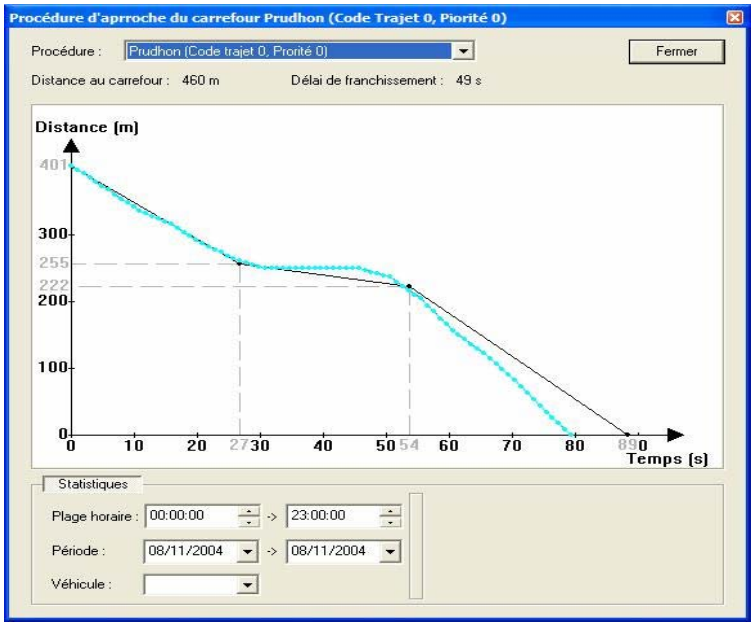


Display of the location points collected by the vehicles during the crossing of a crossroads.

These location points are recorded by **LCU-Prio** in “monitoring” mode during the regular services.

They are automatically collected by the PC when the buses return to the depot. They make it possible to determine, confirm or modify the location zones of the priority procedure.

Statistical analysis with PRIO-Stat

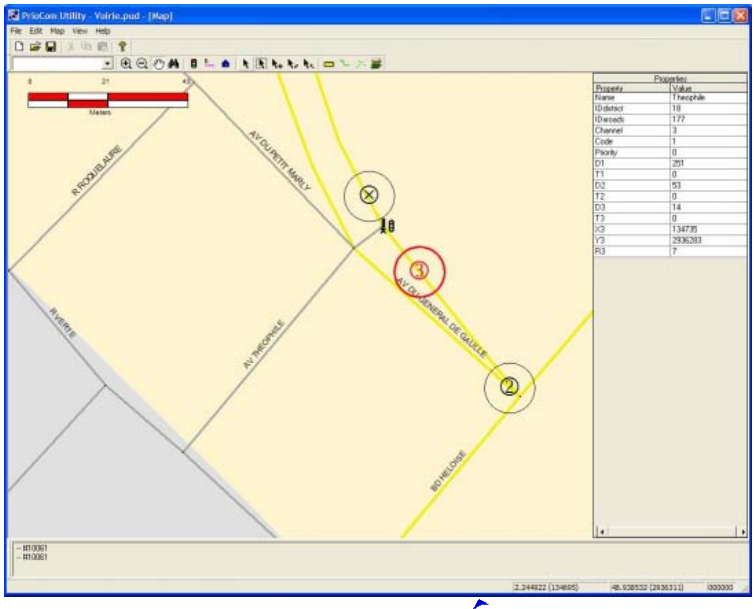


Comparison between the real and the theoretical curves of approach.

Control of the drift of the profiles of approach and possible re-parameter setting.

The statistical analysis can be done according to many criteria's: time procedures, ranges over period, population of vehicles and/or traffic lights controllers, services, courses, average profile of approach…

Correction of the profiles of approach



After the initial parameter setting which aims to determine the theoretical profiles of approach and the analysis of the data collected by the vehicles during regular services, it is possible to rectify the theoretical models to prevent that the system drifts with the evolution of the traffic.

The new models of approach will be automatically downloaded in the buses through the radio data network at the depot.

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