**B_us** is a crowdsourced and scalable method to improve urban and metropolitan sustainable mobility through bottom-up planning projects by deploying demand responsive bus routes, suited to participants commuting needs, that includes a personalized and real-time information system that provides estimated time of arrival.

Methodology

In this research, we propose a methodology that reduces the data cost and the time and human capital invested in obtaining mobility patterns information. The methodology consists of the following four stages:

STAGE 1: app set-up

The technical target of this phase is providing a universal interface that citizens can use to subscribe to the program by adding their mobility patterns information, and so the management team can monitor the usage of such interface, the proposed system architecture is:
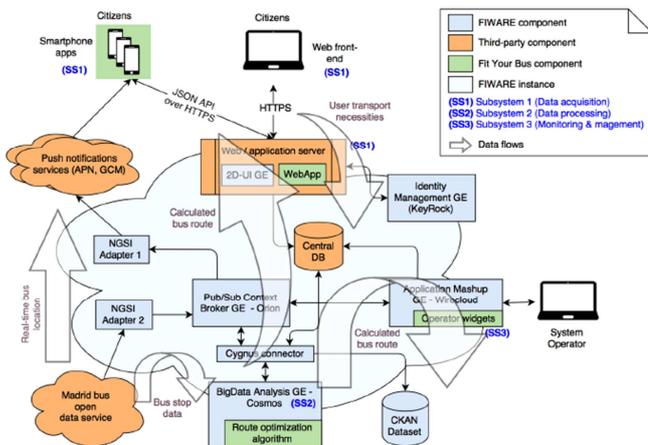
For more information about the architecture or how we developed the back-end service, the public front-end (both web and app) or how we manage the interface front-end, please send an email to our IT Director: Rafael Barriuso (rbarriuso@tribalyte.com).

STAGE 2: data gathering

Users will provide their basic commuting data –origin, destination, work hours, etc- using our web/smartphone app.

STAGE 3: data treatment

These inputs will conform a database that will be converted into a proper Origin-Destination Matrix through a statistical analysis. As can be observed, single citizen objective optimization algorithm influences the development of the multi-objective optimization branches in the problem. Obviously the resulting Origin-Destination Matrix needs to maximize the utility for the whole of users.

The bus routes optimization is performed through an ad-hoc algorithm that maximizes the overall time savings for the participants.
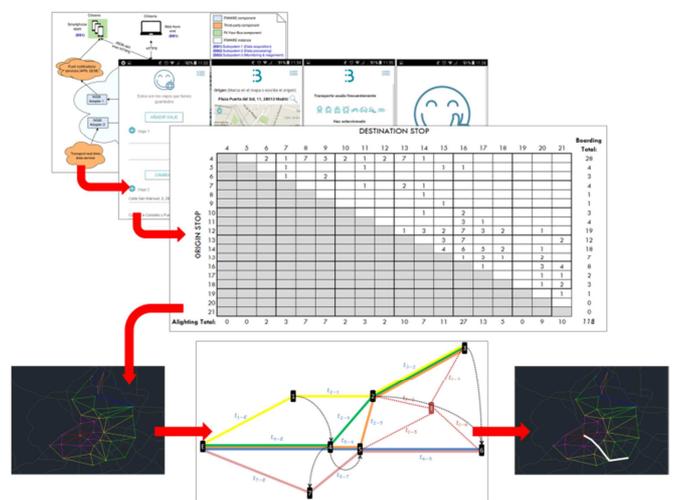
STAGE 4: start up and performance

In coordination with local authorities, resources (bus and drivers) will be allocated to deploy some of the calculated routes. While the new routes are functioning, web and app users will receive real-time and personalized information regarding the route stops and schedule. User who not benefit directly from these new routes will be encouraged to spread the voice among neighbours and coworkers, maximizing their own chances of being direct benefiters in the next line deployment.

Are you interested in applying our project to your city? Request more information to our CEO: Miguel Álvarez (miguel.alvarez@hecateingenieria.com).

Applications

B_us provides a powerful tool to gather commuting data, particularly Origin-Destination Matrix, an essential input that aids decision-making in planning and management of transport networks.

Furthermore, we offer a deep tailored analysis of the obtained data through our self-developed algorithm, based on a new *"minimum path & maximum number of users"* algorithm implemented in MapReduce programming model and run on Apache Hadoop/ FIWARE Cosmos, according to the customer's needs and their time perception, and provide the necessary information on how to enhance their transport services.

Taking advantage of Big Data attributes, the system is fully scalable: as new citizens start using the web and app, the algorithm will recalculate the bus routes, offering new possible lines to be deployed. Since the cost savings requisite is built in the architecture of the system, the more resources allocated to the project, the more overall increase of the efficiency of the transit system.

But not only that! This is only one of the applications of B-us, because our crowd sourced and scalable method

to adapt and evolve buses lines through mobility surveys allows Transit Authorities to gather key data for transit planning for a fraction of the cost while engaging citizenship in the process. User can feel part of the transit planning process and see the system adapt to their transport needs. Then, B_us is able to attend to other problems of different kinds as represents the following chart with little adaptations of the algorithm design:
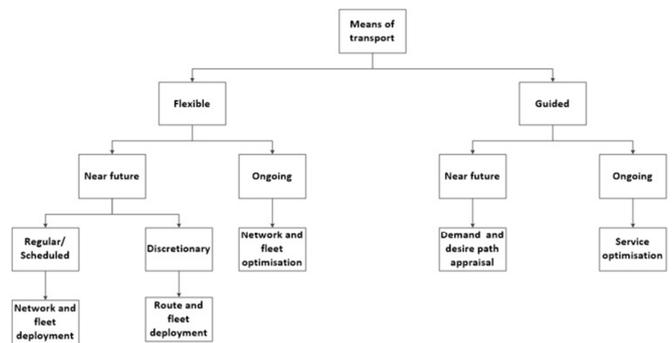
Do you want to know something more about our algorithm or about our future research? Please, get in touch with our Technical Director: Samir Awad (samir@urbanismoytransporte.com).
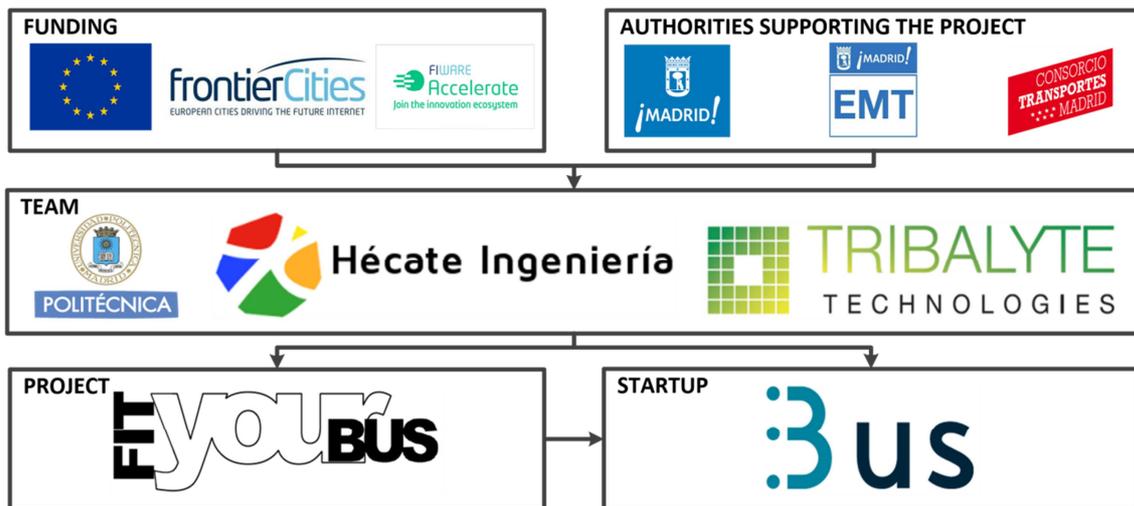
B-us is a system to deploy flexible buses lines adapted to the users' needs. A big concert is happening in your city. Then only thing the attendees have to do to get to the venue is download the B-us app or enter in the web and fill a quick survey. Our algorithm will calculate the optimal route for your bus, and we will inform you where and when you have to wait for the bus to pick it up!