



setec
international

Mobility studies

Dynamic pedestrian simulations

Transports et leurs infrastructures



Construction et urbanisation



Energie et industries



Développement durable



- ④ Activities in transport and mobility studies

- ④ Dynamic pedestrian simulations
 - ④ Introduction
 - ④ Tool and methodology
 - ④ Progress of a study

- ④ References and examples



Setec company

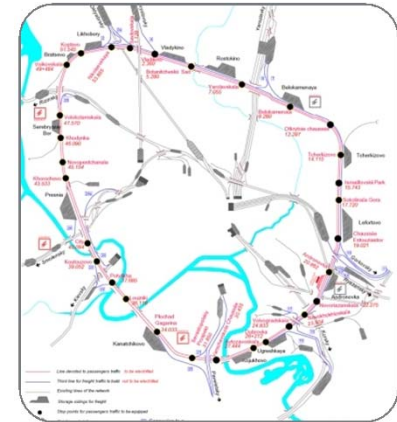
- Multidisciplinary engineering
- 254 M€ turnover in 2015
- 2 400 employees in the world
- Independant
(100% of the capital held by its employees)
- Created in 1957 in Paris



Team : 30 engineers, with Masters in economics and geography

Activities :

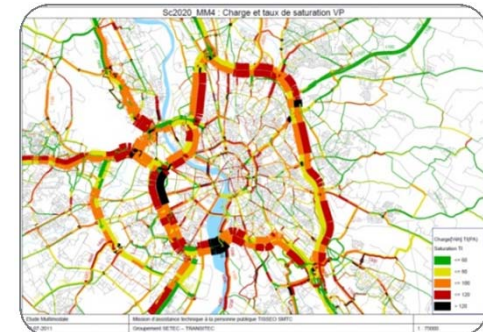
- ④ **Transport planning**
- ④ **Mobility and urbanization**
 - ④ Urban travel plans
 - ④ Mobility/transports : urban projects evaluation, **Functional studies of poles of exchange**
 - ④ Sustainable mobility
- ④ **Traffic modeling**
 - ④ Urban/Interurban
 - ④ Travelers/merchandise
 - ④ All modes of transport
 - ④ Static and **dynamic models**
- ④ **Socio-economic feasibility studies**
- ④ **Economic and financial studies**



Railroad belt Moscow



Exchanger modeling (Marseille)



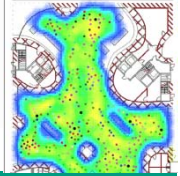
Flow map (Toulouse)



- ④ **Dynamic simulations of pedestrians are at the crossroads of the expertise of the planning department at setec international**
 - ④ Functional studies of poles of exchange
 - ④ Implementation of dynamic simulation tools initially for the road section

- ④ **Development of an in-house competence on the basis of an initial partnership with EMSSYS, french company marketing Anylogic**

- ④ **Application to exchange centers, airport terminals, railway stations, tram stations, and all types of buildings with complex flow problems (volumes, circulations ...)**
 - ④ In classic running operation,
 - ④ In exceptional operation: emergency evacuation for example

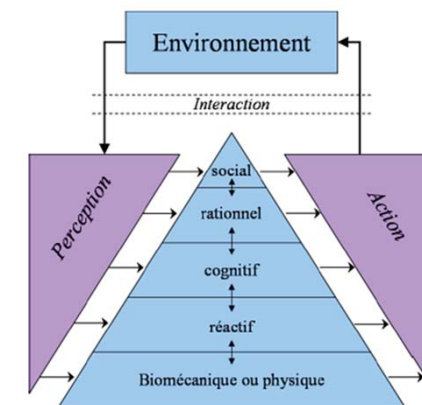


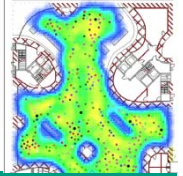
Multi-agent approach simulation

- Organization of flows in a constrained space is a very complex problem. Simulation process aims to simplify this problem, and – based on hypothesis – to make it work in order to learn from it about a new situation. Simplification is made through several types of agents :

 - « space » agents : waiting areas, circulation areas..
 - Dynamic agents who have the ability to move on their own initiative and generate flows: visitors, pedestrians, vehicles ...
 - Static agents who – unlike dynamic agents – are fixed or can be moved by other agents : escalators, control lines, ticket outlets...

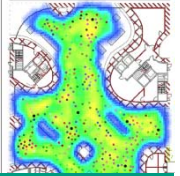
- Anylogic integrates the above three types of agents and allows to model the pedestrian behavior on 3 levels of intelligence: reflexive, reactive and cognitive





Progress of a study

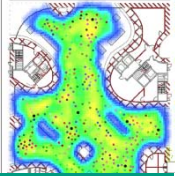
- Collection of input data :
 - Flow to simulate : volume, characteristics, and all associated hypothesis (share of groups, share of travelers buying a ticket at the cashier or at the counter, time spent in each part of the building...)
 - Plans of the spaces to be simulated and the characteristics of the different equipment (width of escalator or stairs, number of queues, etc.)
- Creation of simulation model with Anylogic and adjustment of the model parameters to reproduce a known situation,
- Realization of simulations and edition of results :
 - Density maps,
 - Numerical indicators (waiting time, queue length, max density at a point ...)
 - 2D and 3D animations,
- Results analysis in order to :
 - Resize some equipments,
 - Propose new flow management alternatives,
 - Propose new space organisation
- Simulations of new configurations



🌐 Bourse du Commerce for the Pinault Paris Collection

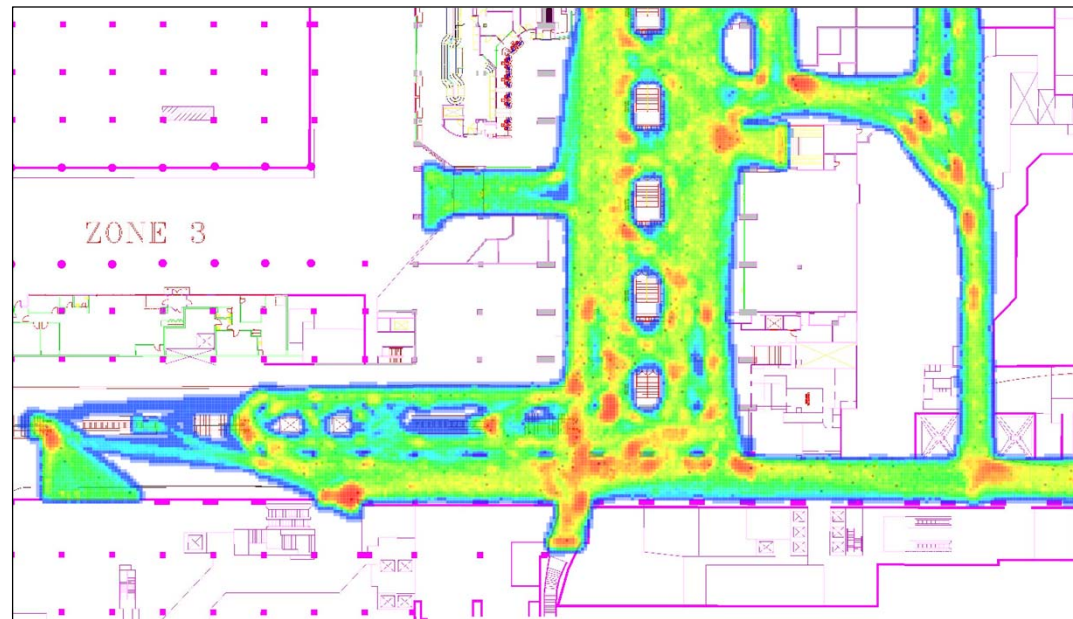
- 🌐 In 2017, the city of Paris conceded for 50 years the building of *Bourse du Commerce* to host Pinault Collection of art, including firstly important works of restoration of the building, whose studies was led by Setec.
- 🌐 Setec international was asked to perform dynamic simulations to ensure fluidity and confort for the flow of visitors expected.





🌐 New metro line in the central station of Montreal

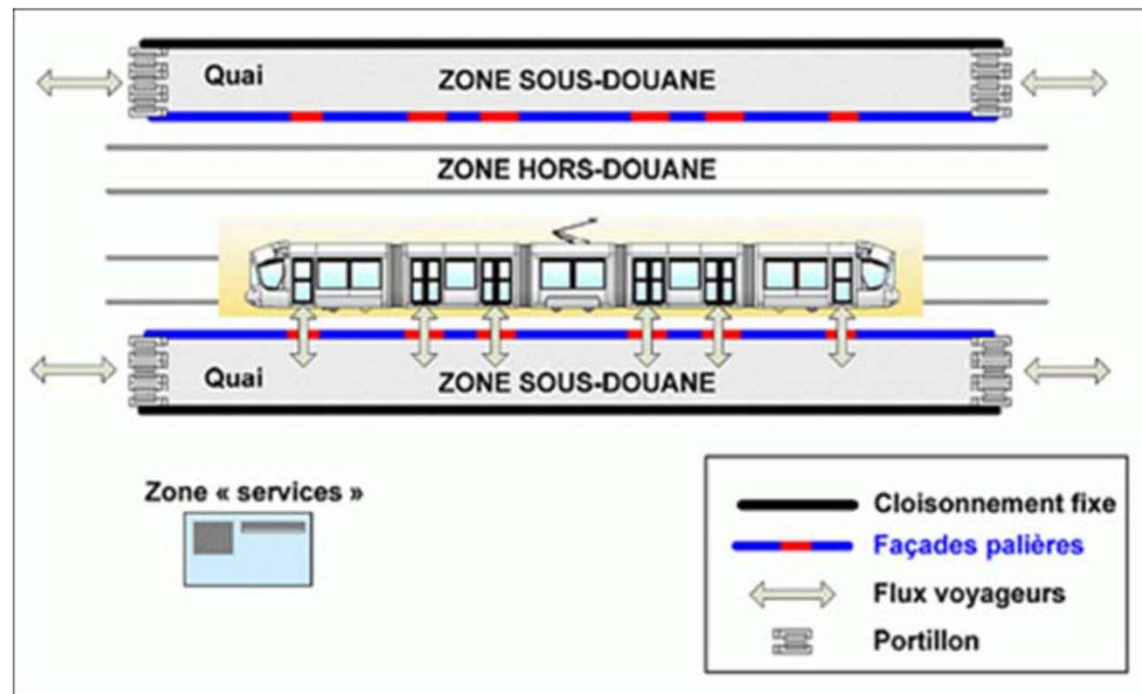
- 🌐 Central station of Montreal is very frequented today : crossing of different flows (train users arriving or waiting for departure, transit flow, commercial areas). The project of a new metro line will add an important amount of pedestrians in the hall of the station.
- 🌐 Setec international was asked to perform dynamic simulations to analyze saturation points and judge the level of service in this situation.

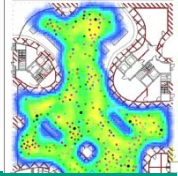




Implementation of a prototype of access control on a tram station in Lyon

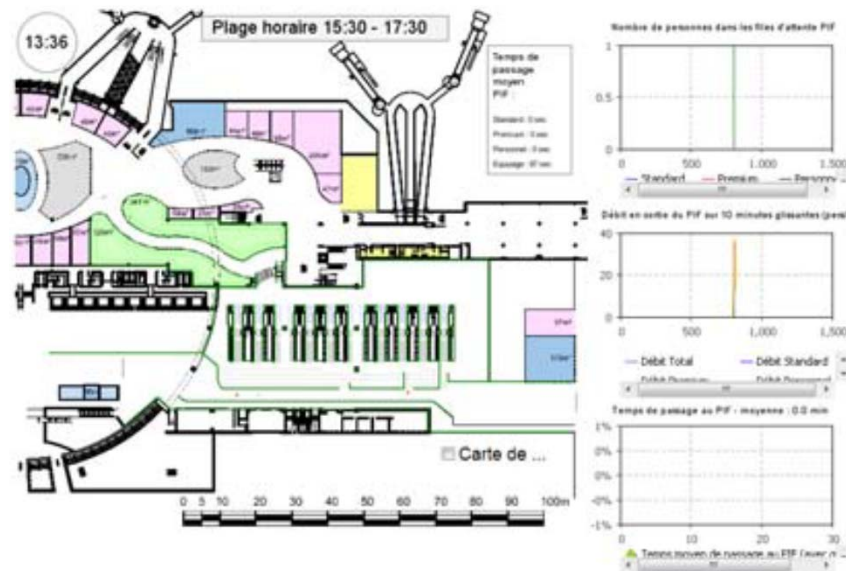
- To combat fraud on its network, a study was ordered in 2010 to examine various access control devices operable at a tram station
- setec international had to make sure that the devices envisaged are compatible with the pedestrian flows generated by the tramway, now and in the future.

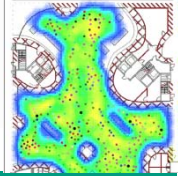




🌐 Nice-Côte d'Azur Airport : redevelopment of commercial areas

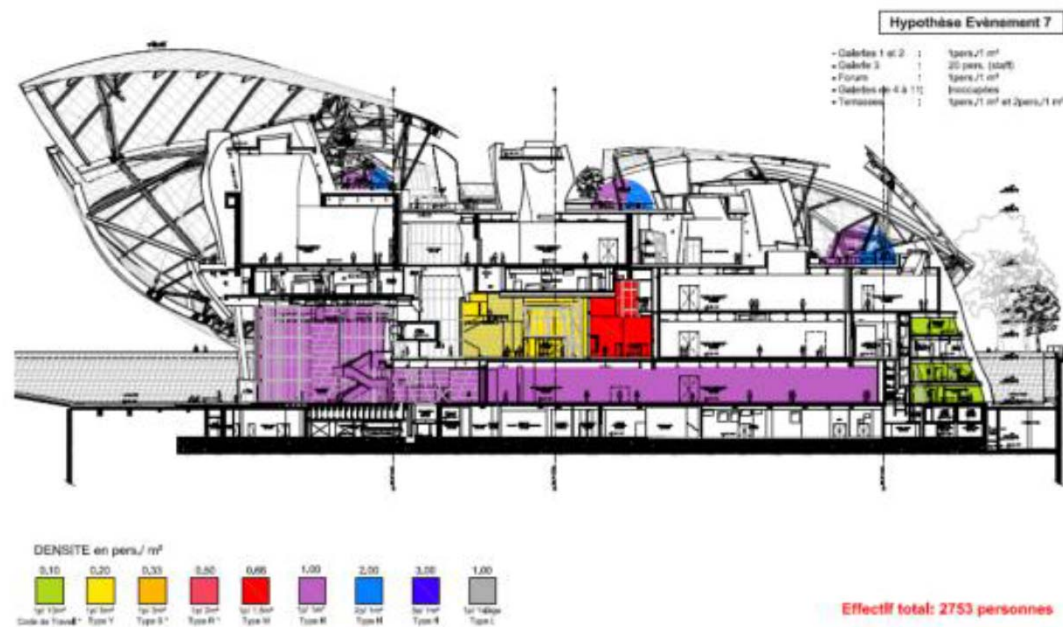
- 🌐 As part of the overhaul of the shops of the terminals T1 et T2 of Nice Airport, Setec International proposed to simulate pedestrian flows for these 2 terminals
- 🌐 Based on real flight plans, flow simulations purpose is to test the proposed solutions and ensure the correct dimensioning of the resources of the terminals. Analyzed resources are:
 - 🌐 Number of checkpoints,
 - 🌐 Organization and surfaces of queues,
 - 🌐 Agent paths.

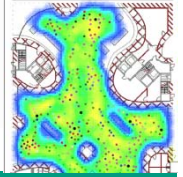




🌐 Louis Vuitton Foundation for creation

- 🌐 *Louis Vuitton Foundation for creation*, created by LVMH company, has the ambition to promote art and culture. The building was designed by the architect Frank Gehry.
- 🌐 The Foundation asked setec international to analyze flows in the building, and propose organizational scenario to host the different types of events planned, and evaluate expected performance using a dynamic simulation model.





🌐 French pavilion of the Universal Exhibition of Milan 2015

- 🌐 As part of the competition launched by FranceAgriMer for the construction of the french pavilion for the Universal Exhibition of Milan 2015, X-TU Architects, asked to setec international to study flow management.
- 🌐 Based on a dynamic simulation of the pavilion, setec international took part in the conception of the project for the flow organization



Thank you !



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