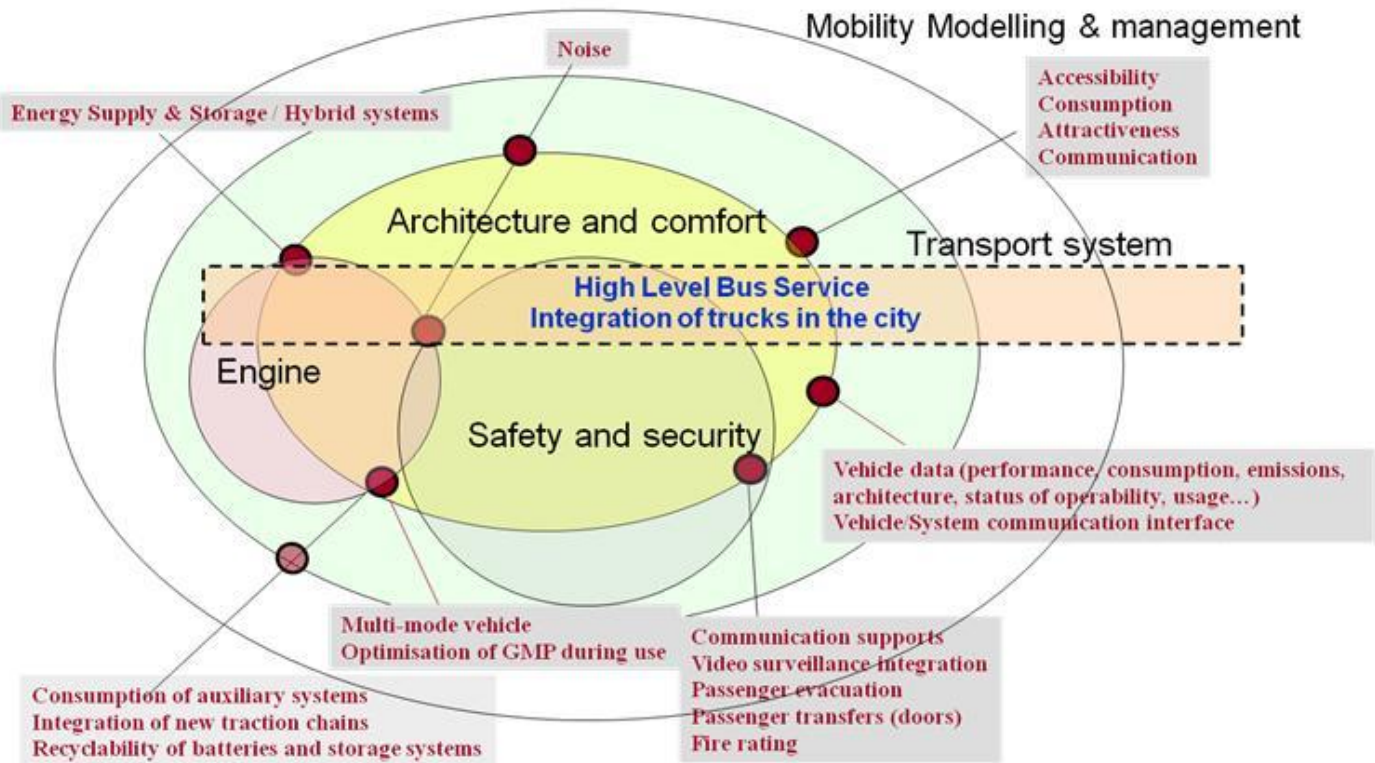




R&D program mapping

Lyon Urban Truck&Bus cluster

“Identification of research topics”: the first stage of the think tank creativity sessions of the cluster that aims at structuring the four research programs. This is the result of a joint effort of the members of the LUTB cluster research / SMEs / startups / major industrial groups:





Engine & driveline

Program Leader : Ms Brigitte MARTIN

➔ 9 fields of research

1) Base engine

- ✓ Optimize engine design to suit new constraints or functions (cylinder pressure, turbo charging, VVA, compression ratio, accessories)
- ✓ Take into account increase in cooling requirements (circuit, fluids)
- ✓ Reduce losses due to friction (materials, lubricants)

2) Combustion systems

- ✓ Improve combustion: efficiency-pollutant emissions (LTC, variable compression ratio, cycles, combustion control)
- ✓ Optimize engine air charging (turbo charging, EGR,...)
- ✓ Improve injection systems (pressure, multi injection, variable angle)

3) Exhaust aftertreatment

- ✓ Develop & optimize NOx & particulate after-treatment systems (strategies, single support)
- ✓ Improve the performance of current catalysts (light-off, durability)

4) Fuels

- ✓ Support legislation evolution
- ✓ Develop new fuel technologies (biofuels, gas) with low CO2 emission levels for common or dedicated vehicles
- ✓ Optimize the engine-fuel matching (performance, durability)
- ✓ Improve the on-board management of fuel (reformer, flex-fuel engines)
- ✓ Use new renewable energy sources for some functions (solar,...)

5) Electric machines

- ✓ Optimize technologies (efficiency, durability, cost)
- ✓ Improve implementation into the vehicle

6) Energy storage & recovery

- ✓ Recover lost energy (kinetic, heat) to improve vehicle efficiency
- ✓ Design high-performance storage systems (technology, control)

7) Hybrid & transmission

- ✓ Develop innovative hybridization modes (choice of internal combustion engines, hybridization technologies) & encourage the development of the technology using adapted evaluation tools
- ✓ Optimize on-board energy management in the vehicle (strategies, plug-in)
- ✓ Improve transmission

8) Control

- ✓ Develop reliable, light & economical sensors & components in phase with new technologies (especially hybrids)
- ✓ Develop powertrain control strategies to optimize consumption & pollutant emissions according to mission profile

9) Noise & vibrations

- ✓ Reduce powertrain noise emission by using optimized designed tools & by setting up active systems
- ✓ Improve characterization of the perceived noise levels to reduce impact by optimizing vehicle technology & usage



Safety & security

Program Leader : Mr Philippe BEILLAS

➔ 5 fields of research

1) Safety of vulnerable passengers & other road users

- ✓ Facilitate mobility of passengers with sensory problems
- ✓ Secure access of passengers with reduced mobility or luggage
- ✓ Eliminate or reduce the danger of impacts
- ✓ An urban transport vehicle in an environment with a high density of vulnerable passengers

2) Safety of transported passengers & goods

- ✓ Reduce risks related to urban delivery of goods
- ✓ Reduce impacts for passengers sitting or without seat belt
- ✓ Predict the vigilance state of the driver
- ✓ Reduce impacts for seated passengers without seat belt
- ✓ Reduce impacts for seated passengers with seat belt
- ✓ Improve surveillance of transported passengers
- ✓ Reduce impacts for unsecured parcels

3) Hazardous materials

- ✓ Reduce risks related to the transport of hazardous materials for residents
- ✓ Reduce risks by the technical overhaul of transport vehicles

4) Security

- ✓ Protect passengers against assault
- ✓ Protect driver against assault
- ✓ Protect parcels against theft & damage
- ✓ Protect transport vehicles against vandalism

5) Ergonomics & safety during operations

- ✓ Reduce risks related to loading / unloading operations by the driver
- ✓ Make driving easier
- ✓ Reduce risks related to loading / unloading operations by third party
- ✓ Reduce the gravity of risks for the driver



Architecture & comfort

Program Leader : Mr Philippe GRAND

➔ 5 fields of research

1) Interior architecture

- ✓ Ease access & movement of passengers in the vehicle
- ✓ Optimize driver's access to on-board goods
- ✓ Make the interior lay-out adaptable for loading & use
- ✓ Optimize ticketing system according to the various types of use

2) Interior comfort

- ✓ Improve the overall sensory comfort for passengers & goods (noise & vibrations)
- ✓ Enhance the ergonomics of the driver's immediate environment, improve the visual & olfactory sensory comfort, as well as the overall general comfort

3) Energy efficiency

- ✓ Make the vehicles lighter while ensuring comfort & availability of all features
- ✓ Encourage recyclability, reduce consumption of accessories & design predictive maintenance tools

4) Information media

- ✓ Organize & display information for the driver
- ✓ Communicate information for passengers in public transport
- ✓ Communicate information for passengers waiting for a bus

5) Design & attractiveness

- ✓ Develop modularity to ease refurbishment & ensure a lasting design, to optimize design & production, to offer a wide range of choice during purchase & make the bus eco-friendly



Transport system

Program Leader : Mr Bernard FAVRE

➔ 6 fields of research

1) Itinerary management

- ✓ Itinerary control
- ✓ Management of vehicle itineraries
- ✓ Management of user itineraries

2) Communication platform

- ✓ Station, delivery zone, Parking area
- ✓ Multimodal platform

3) Infrastructure layout, prioritization, regulation

- ✓ Regulating & limiting infrastructure
- ✓ Intelligent & communicating infrastructure

4) Supervision, decision aid

- ✓ Management & decision aid (risks, incidents)
- ✓ Data observatory (real time & indicators)

5) Identification & localization

- ✓ Identification & localization of
 - vehicles (trucks & buses)
 - persons
 - goods
 - operating conditions

6) Adaptable vehicle – infrastructure connection

- ✓ Mixed passenger-goods use
- ✓ Adaptable vehicle (in time &/or space)
- ✓ Facilities for vehicles



Mobility modelling & management

Program Leader : Mr Yves CROZET

➔ **8 fields of research**

1) Optimizing public roadways, tailoring road usage

- ✓ Understanding urban mobility
- ✓ Anticipating the evolutions of mobility
- ✓ Real-time optimization

2) Urban process

- ✓ Building the city: transportation adapts to the city in the short term & moulds the city in the long term
- ✓ Economic development & transport: economic model, tollgate, zone-crossing cordon or urban congestion charge schemes ...
- ✓ Mobility & planning model, management of short-term modelling

3) Real-time modelling of journey times

- ✓ Acknowledgement of infrastructure modification according to periods & situations
- ✓ Interaction between the modes & data of the different transport systems in use: switching between modes
- ✓ Balance between long-term modelling data & evolution of real-time situations

4) Guaranteeing data cohesion

- ✓ Standardizing intersystem data exchange
- ✓ Data recovery
- ✓ Transforming static models into dynamic models
- ✓ Modifying space & time, extending duration of time with a move towards 24h/24 infrastructures. (ex.: re-examination of the speed criterion & the validity of its continued priority)

5) Platform for city evaluation & lifestyle

- ✓ Integrating block models for validation (ex.: environment & flow model, urban layout)
- ✓ Dialogue between models
- ✓ Dialogue of space & time models

6) Platform for city evaluation & lifestyle

- ✓ Goods purchased on the Internet, goods purchased in urban & suburban commerce, household refuse
- ✓ Integrating goods transport into the PDU (urban mobility master plan): link between goods mobility & urban constraints
- ✓ Modelling vehicle mobility

7) Business travel : craftsmen

8) Economic model : cost of transportation