Discover autonomous shuttles, commissioning, & operations

Q&A on the theme of autonomous shuttles

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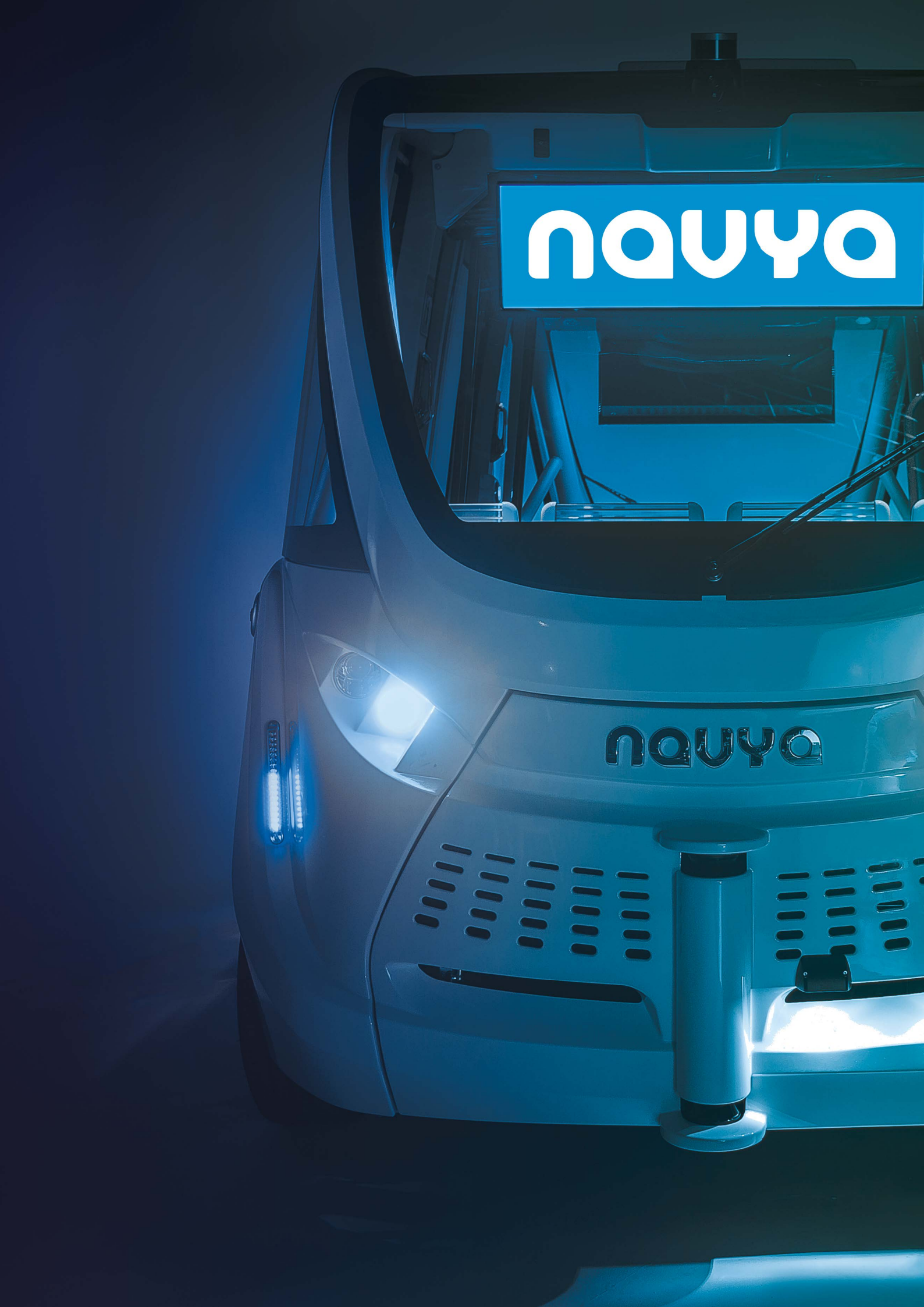
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Introducing autonomous Shuttles

New services and trials of **autonomous vehicles and self-driving shuttles** are multiplying in our cities.

At **NAVYA**, our passion for new technologies drives us to improve urban mobility and meet its challenges.
By developing and commercializing **new autonomous, driverless and electric transportation solutions,** we revolutionize mobility in cities and on private sites, day after day.

Considered to be **the new revolution in transportation,** autonomous vehicles generate a lot of interest, and questions.

The purpose of this document is to answer to questions and provide facts about autonomous vehicles.

Introducing autonomous shuttles

1. What is an autonomous shuttle?

An autonomous shuttle is a vehicle, operating without a driver, dedicated to collective transport on the first and last mile. Self-driving shuttle fleets can be operated on public roadways for city residents or private sites for company employees/visitors.

2. What is the first and last mile?

The **"first and last mile"** refers to the distance from a starting point to a transportation network, or the distance remaining from a transportation network to a final destination. For example, the distance from your home to the nearest train or metro station, and then the distance from the station to your place of work.

3. How does it work?

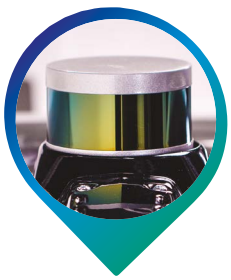
An autonomous shuttle is **equipped with an onboard computer and various sensors.** The sensors used by self-driving vehicles include **cameras, LIDAR sensors, sensors related to GPS technology as well as odometric sensors.**

All of these sensors **perceive and model the environment** in which the shuttle is operating, and communicate this information to the onboard computer. The onboard computer continuously consolidates and prioritizes the perceived data in order to make optimal decisions.

Cameras

Odometric Sensors

GNSS Antenna (GPS Technology)



LIDAR Sensors 360° multi-layers

LIDAR Sensors 180° mono-layers

Practical questions and regulations

4. What technologies are used by autonomous shuttles ?

LIDAR Sensors

Provide 2D & 3D perception maps of the environment to allow for precise vehicle positioning and obstacle detection.

Cameras

Detect obstacles and estimate their position relative to the vehicle. Enhance perception maps with environmental analysis (road signs, traffic lights) and classification.

GNSS Antenna

Communicates between a GPS sensor and a base station to determine the precise position of the vehicle at any moment.

Odometry

Measures the displacement and speed of each wheel to estimate the velocity of the vehicle and change in position.

5. What ensures the reliability of autonomous shuttles?

Self-driving shuttles are equipped with **multiple sensors** that enable them to **both position themselves precisely** in their environment **and adapt their speed and direction depending** on the situations encountered.

Thus, the fusion of the data computed in real time by the different sensors enables the autonomous shuttles to confirm at any moment and to the nearest centimeter **their position and to identify different obstacles** to make the optimal navigation decisions.

6. How does it work with insurances?

Insurance companies calculate the risk involved in a particular activity in order **to determine the insurance premium.**

Therefore, **autonomous vehicles are not difficult to insure,** due to the fact they mechanically lower transportation-related risks.

Practical questions and regulations

7. Can autonomous shuttles operate on public roadways?

In cities

Self-driving shuttles can operate on public roadways. For this, an authorization must be requested to the competent authorities.

It is simple **to apply for a registration certificate** with NAVYA :

- Submit a technical report about the vehicle
- Submit a presentation of the trial

8. Can autonomous shuttles operate on private sites?

Private sites

No authorization required

No authorization is needed for self-driving shuttles to operate on a private site.

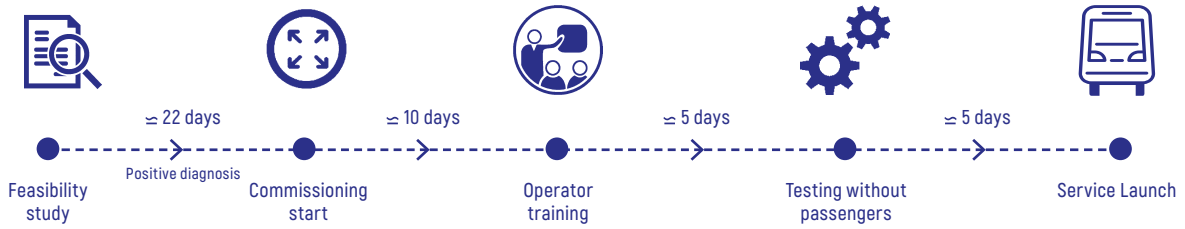
POSSIBLE APPLICATIONS

- Airport
- Resort
- Campus
- Theme park
- Hospital
- Industrial site

9. How are Navya autonomous shuttles deployed and launched?

From project launch to the launch of the service, the NAVYA team supports you throughout the entire process.

THE COMMISSIONING PROCESS



Practical questions and regulations

10. What are the advantages of a Navya autonomous shuttle fleet?

Enhance the efficiency of the transport system

Increase the capacity of the transport network

Serve new areas

Examples of deployments

In cities:

Navly

In Lyon, since September 2016, KEOLIS has been operating two NAVYA autonomous shuttles in the Confluence District. Atfer exiting the tramway, city residents can take a shuttle for the last mile along the riverbank.

PostBus

In Sion, since June 2016, two NAVYA autonomous shuttles operated by PostBus have been taking city residents and visitors from the touristic town center to the train station.

Masdar City

In Abu-Dhabi, three AUTONOM SHUTTLES have been operating, since September 2018. The shuttles transport over 4,500 residents and workers weekly. The autonomous shuttles connect Masdar City's car park area to the city centre.

Private sites:

Total

In Dunkirk, from 2018 to end of 2019, two AUTONOM SHUTTLES were operated by Berthelet. These shuttles provided transport for TOTAL employees to their international training site, classified as Seveso. To optimize service according to the number of visitors, the fleet of vehicles ran continuously or on demand.

Tepco

In Fukushima, between 2018 and 2019, working in collaboration with SB Drive and Mitsui, three NAVYA autonomous shuttles have been improving mobility within the power plant.

University of Salford

In Salford University, one AUTONOM SHUTTLE has been operating since October 2018. This shuttle provides a link for students and visitors to Salford University's main campus, to their secondary location in Media City.

Providing unique expertise and support

11. How can autonomous shuttles integrate into the existing public transportation offer?

A fleet of autonomous shuttles is intended to fit **perfectly and complementarily into the existing public transportation offer**. It provides a mobility solution on the last mile: at the exit of a train or metro station for example.

Autonomous shuttles allow you to improve the service on **the first and last mile**, to increase the flow of the transportation network and to serve new zones.

12. How is Navya's quality autonomous shuttle service guaranteed?

To provide quality service and ensure the safety of passengers onboard self-driving shuttles, **supervision and maintenance services** are available to our clients.

Maintenance Service

The maintenance service is extremely **responsive and offers the latest breakthroughs in autonomous vehicle technology.** Our Maintenance Service ensures continuity, from diagnosis to replacing parts or components.

Supervision Service

NAVYA LEAD is the platform which monitors, manages and optimizes the operation of on-duty shuttles. Responsive and available, our Supervision Service ensures continuous fleet management, if so desired, guaranteeing optimal operations.

About the Navya autonomous shuttle

13. Where are Navya autonomous shuttles already deployed?

Today, NAVYA has sold **160 shuttles**
to clients located in **20 different countries.**

Operating in Australia, Austria, China, Denmark, France, Japan, New Zealand, Singapore, Switzerland, USA and many more.

14. What are the technical specifications of the Navya autonomous shuttle?

100 % Autonomous ● Driverless ● Electric

15 passengers
11 Seated
4 Standing

Dimensions
Length 4.75 m
Width 2.11 m
Height 2.65 m
Empty / Gross weight
2,400 kg / 3,450 kg

Operating speed
25 km/h

Average autonomy
9 hours

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"Autonomous shuttles enable you to improve your transportation offer on the first and to last mile and to serve new areas using a new economic model."

Henri Coron, Chief Business Development Officer

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