Autonomous Transport Systems

November 2020

MOVE

transdev
the mobility company

transportation
technology
by transdev

OPERATOR AND GLOBAL INTEGRATOR OF DAILY MOBILITY

- 11 million passenger trips every day
- 18 countries
- Networks from few vehicles to fleets of 400+buses
- 7.4 bn net revenue

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Transportation issues
a key challenge is the future to make cities liveable

More and more inhabitants in cities with mobility needs:

- +3.4B additional residents will be living in cities by 2050
- 30% of traffic in urban areas is caused by cars looking for a parking spot
- The majority of transportation is done with personal cars with trips < 8km

And a city infrastructure that is incapable of growing:

- Congestion will increase
- Quality of life will decrease

We are here to make cities better, by improving PT services we encourage more people to use PT!

Cities are suffering from rapid demographic changes, increased congestion and pollution concerns

Shared mobility is contributing to better-functioning cities but does not meet the needs and expectations of all people

Private-owned cars or mass transit alone are not the solution

We need to make Public Transport more efficient and attractive!

AV expected benefits
have triggered excitement and investments

Promising benefits for both customers and public welfare…

Save time
(only in the US, 100M h/day commuting)

Save lives
(90% of accident due to human)

Save money
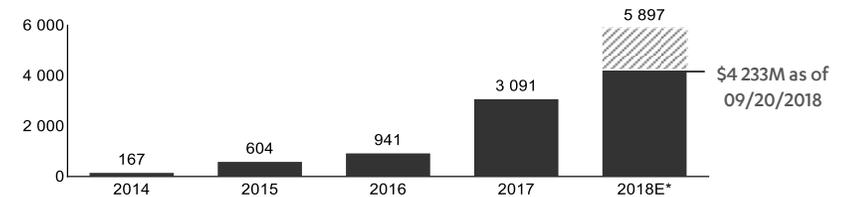(People may not possess a car anymore)

Save space / Transform our cities
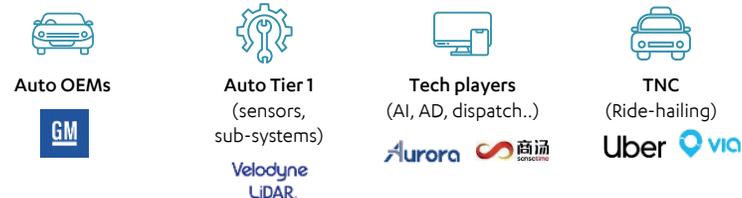(Less congestion, More social links)

… have generated hype for AVs, notably through increasing investments over past years

Global – Funding to AV technologies
(2014-2018E, in $M)

5 897
$4 233M as of 09/20/2018
3 091
941
604
167

6 000
4 000
2 000
0

2014   2015   2016   2017   2018E*

Estimates based on extrapolated funding as of 09/20/2018. Source: ATS, CBInsights, Bain analysis

Auto OEMs
GM

Auto Tier 1
(sensors, sub-systems)
Velodyne LiDAR.

Tech players
(AI, AD, dispatch..)
Aurora   商汤 sensetime

TNC
(Ride-hailing)
Uber   via

Strong expectations towards autonomous vehicles

Note: (*) Estimates based on extrapolated funding as of 09/20/2018.
Source: ATS, CBInsights, Bain analysis

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Public transport improvement
is needed to tackle urban issues

- Self-Driving technology alone won't be the unicorn that solve everything

- It will be a catalyst: Electric, Shared and Autonomous Vehicle if integrated in PT networks could have a huge positive impact!

Electric

Shared

Autono-mous
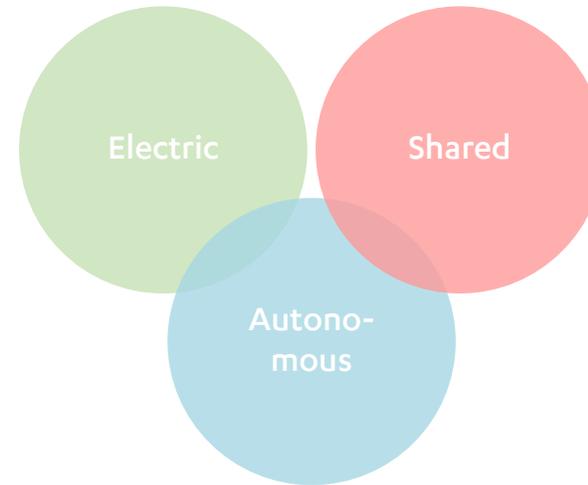
AVs are a good opportunity to make PT more efficient and attractive

However,

significant challenges remain...

Major challenges have emerged ...

AV technology not fully mastered :
- **< 99% of situations** currently managed; remaining difficult **to tackle/isolate**
- **Compute components (HW)** not safety-certified yet

High price of Avs raising doubts about future TCO due to :
- High price of component (e.g. sensors, vehicles)
- Uncertain costs of insfrastructure deployments
- Safety operator in the short term

Difficulty to scale and deploy in different locations

Low quality of service
- Low speeds and autonomous capabilities
- Limited passenger capacities

Public acceptability of AVs to be tested

... delaying the emergence of AV

WAYMO

« We are confident that our cars are reliable and **ready to start test-driving without a test driver** in the driver's seat »

Waymo, CEO, Nov. 2017

↓

« Waymo has sent out an email to its test members, letting them know that **completely driverless cars are on the way** [for tests] »

The Verge, Oct. 2019

GM cruise

« GM says it will have a ride-sharing service featuring its line of self-driving Chevy Bolts ready ro go by 2019 »
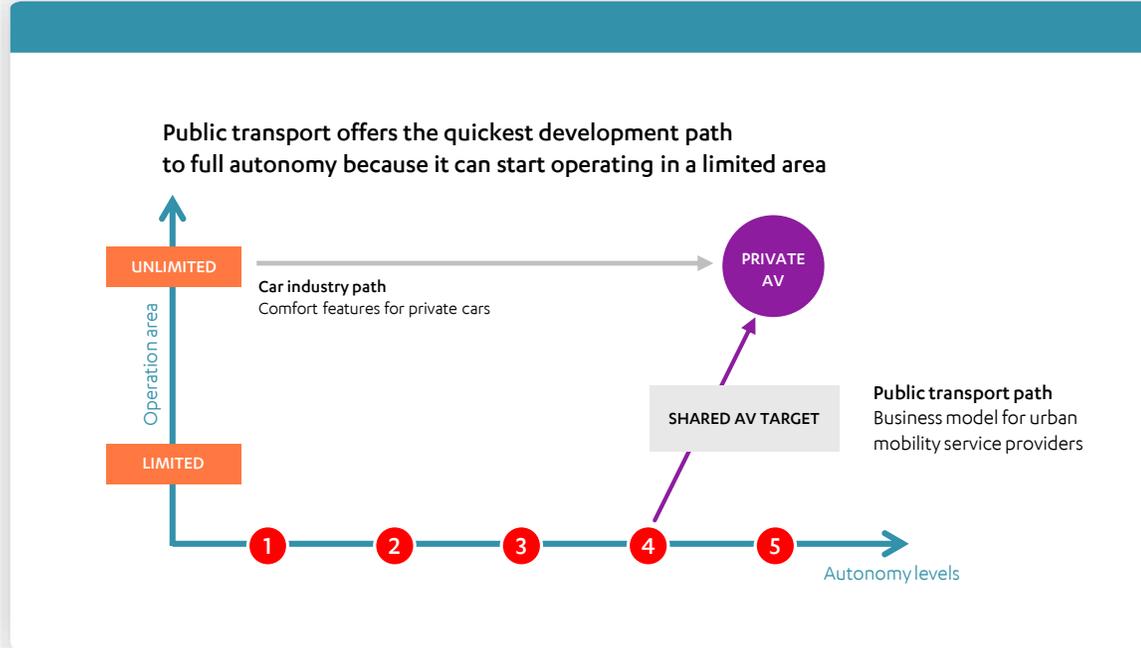
The Verge, Nov. 2017

↓

« In order to reach the level of performance and safety validation required [...], we will be significantly increasing our testing [...] which has the **effect of carrying the timing** of fully driverless **deployment beyond the end of the year** »

The Verge, Oct. 2019

Source: Expert interviews, Crédit Suisse, Evercore ISI Automative Research, Litsearch, Bain analysis

Public Transport
will be among the first for AVs

Public transport offers the quickest development path
to full autonomy because it can start operating in a limited area

UNLIMITED

Car industry path
Comfort features for private cars

PRIVATE AV

Operation area

LIMITED

SHARED AV TARGET

Public transport path
Business model for urban
mobility service providers

1 2 3 4 5

Autonomy levels

Business with shared vehicles will be possible before private vehicles.
Technically easier:

- Low speed (<70 kph) *
- Limited geographical area **
- Controlled and pre-registered path ***
- Human-in-the-loop is possible

Business model more accessible for shared cars:

- The cost of AD is shared between users
- In the case of public transport, AD replaces the driver

Client acceptance

- Our clients already delegate the driving activity to the chauffeurs

Key milestones

50+
Deployments* in 10 countries

3.5m+
Passengers transported
(no steering wheel nor pedals)

1.6m+
Km travelled

8.7/10
Customer satisfaction score (average)

2/3
Share of international projects

Multiple deployments with different vehicles

Two important R&D projects to test our developments in supervision, connected infrastructure or dispatch systems & learn how to deploy and run AV mobility services

Rouen Normandy Autonomous Lab
Last-mile service from metro station

- In partnership with the city and Renault-Nissan
- Supervision connected to Renault-Nissan AD
- Supervision to be connected with existing PT supervision
- ~10km road in open road
- Operations with 4 Renault Zoe in 2018 – 2019 and with i-Cristal shuttle in 2021

Paris-Saclay Autonomous Lab
Night service on a BRT line

- In partnership with ADEME and Renault-Nissan
- ~3km trip on a dedicated lane (shared with traditional PT)
- Project fully operated by ATS on i-Cristal shuttles (other section operated by Renault with Zoe)
- First testing phase achieved in 2019

Our focus

Offer Cities mobility services while ensuring
- The system local safety case
- A competitive customer experience (cost & quality)

**Our focus is to provide
technologies and services to support local operators to deploy and run
autonomous mobility services**

Customer-centricity and customers' trust

97%

*Feeling of trust
of Transdev passengers
in our autonomous
mobility services*

The results of our customer surveys:

❯ **Customers trust us:**

- Customers are quickly reassured when then use autonomous solutions
- Confidence rise higher when customers visit the Operating Control Center

❯ **Customers want more:**

- Customers have high expectations for their experience (comfort, Wifi, ability to communicate with a human supervisor…)
- Customers want more autonomous services, they want to use it on a daily basis

❯ **Learning by doing:**

- By our operations, we understand customer needs and adapt our solutions for a daily basis operation.

Range of applications

Taking care of travel to nearest mass transit station

Providing a night-time or off-peak service

Facilitating mobility within city centers and tourist attractions

Serving a private or restricted site

TRANSDEV AIMS AT BEING A WORLD LEADER IN AUTONOMOUS VEHICLE FLEETS OPERATION

Transdev already is with 3.5m +pax without steering wheel / pedals