

U-Shift

- A novel on-the-road modular vehicle concept

Stuttgart, March 2019

DLR - Institute of Vehicle Concepts

A satellite image of the Earth showing the Atlantic Ocean, Europe, and parts of Africa and Asia. The text "Wissen für Morgen" is overlaid on the right side of the image.

Wissen für Morgen

Content

- Requirements based on tomorrows mobility
- U-Shift vehicle concept - „Modularisation On-the-Road“
- Application examples
- U-Shift Family / Modular system
- Comparison Mover-Concepts
- Vision



Trends and Interactions

Technology trends and framework conditions reinforce each other

Diversification of mobility

- Urban measures discourage private vehicles
- New, on-demand business models; away from car ownership

Autonomous driving, connectivity

- Legislative questions are clarified
- Safe and reliable technologies are being developed

Electrification

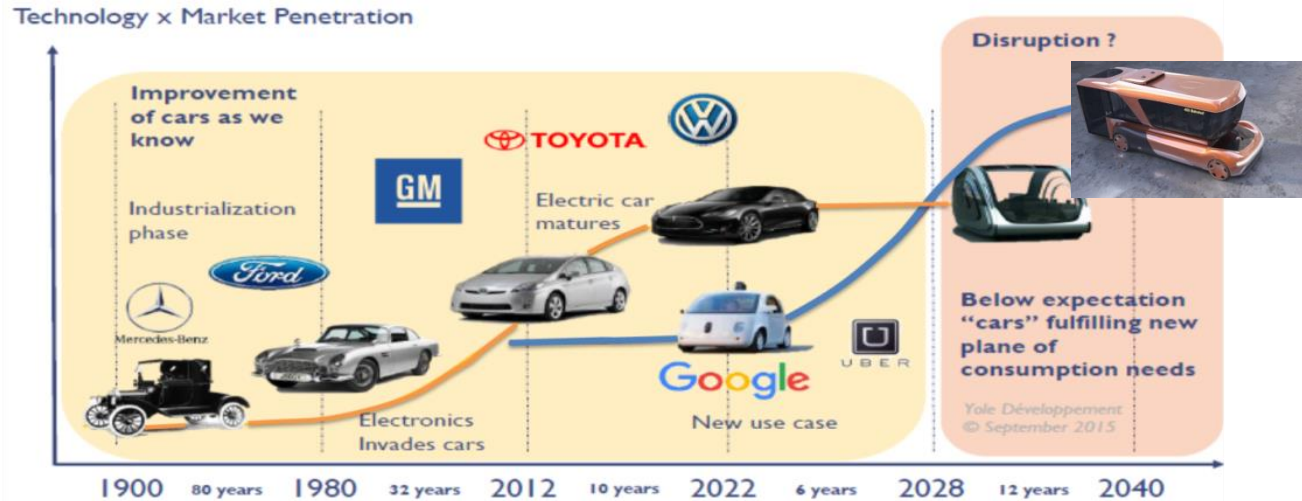
- Battery prices continue to decline
- Energy density and driving range increase

Ecology and energy efficiency

- Legislative emission limits to be strengthened
- 2°C-target: alternative green technologies are promoted



Disruptive innovations will shape future market for mobility



YOLE, Sensors and Data Management for Autonomous Vehicles (2015)

Future After-Sales Markets

- Goldman Sachs: Components for automated driving (2050)
→ 300 bn US\$
- Yole: Sensor modules (2030)
→ 36 bn US\$
- Boston Consulting: Market for autopilot-functions (2025)
→ 42 bn US\$

Disruptive Innovations combine several factors of success

Disruptive innovation Smart-Phone:
hardware-platforms + Touch Screen + Apps
+ rapid innovation and new markets
= Disruption in cell-phone-market

U-Shift project:
modular/electrical vehicle + open platform + urbane
application + SAE5 automation
= Disruption in mobility market

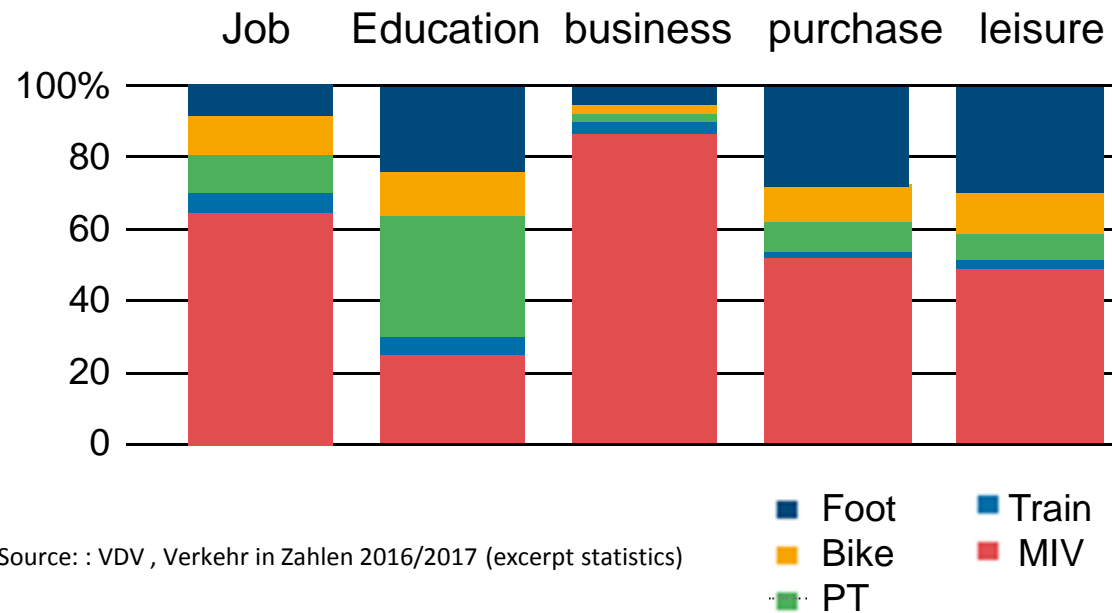
Goal U-Shift: → New „Game Changer“



Requirements / Needs

Passenger traffic

Modal-Split by purpose 2014 - Traffic volume



MIV = Motorised private transport; PT = Public Transport

MIV dominant for many driving purposes

Wanted:

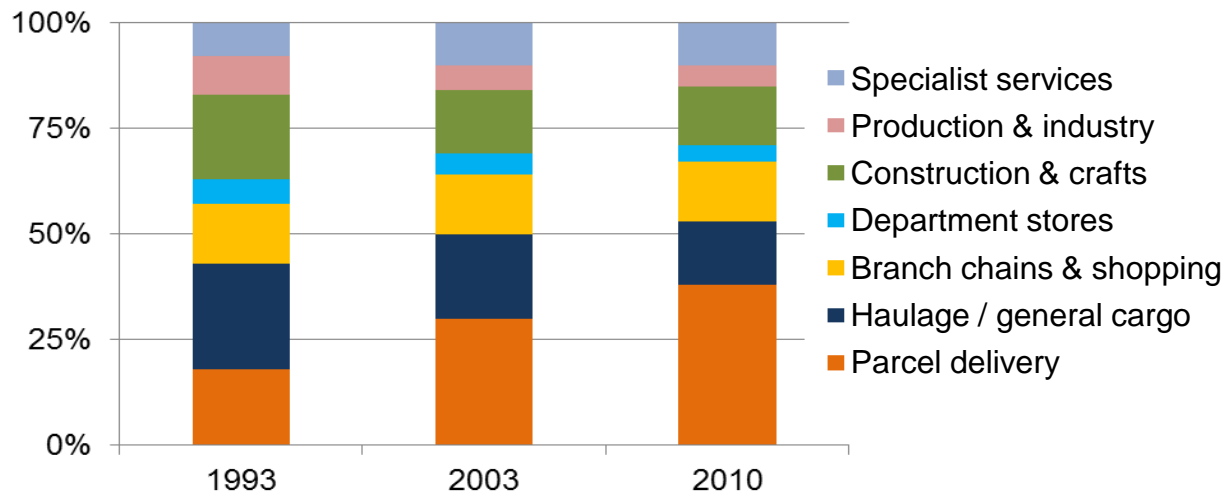
- Mobility solution for people with multiple travel purposes
- Integration / Increase PT
- Improving transport efficiency
- Alternative for conventional MIV (Attractive)
- Business models, ...



Requirements / Needs

Commercial traffic

Share of truck journeys in urban commercial transport



Source: DLR own presentation

CEP share of tours strongly increasing

Wanted:

- The most universal transport solution for diverse commercial traffic
- Efficient, economic urban freight transport
- Integration / combination into existing logistics infrastructure
- Flexible formats, volumes und weights
- Business models, ...



U-Shift enables change in the mobility sector!



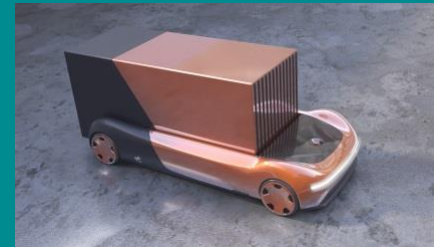
„on-the-road“ modularization



MIT*:
Private
Individual capsule
taxi, fleet, ...



PT#:
Peplemover,
district bus,
taxi, ...



City-logistics:
CEP\$, last-mile,
retail, crafts, artisan,
general cargo, ...

Driveboard:

- Standardized
- Highly automated
- Electrically driven
- Large quantities
(Industry)

Capsules:

- Individualized
- Flexible
- Application optimized
- „Simple“, low weight,
cost effective
- Large no. of variants
(SME)

Application example: People-Mover

Driveboard + Capsules

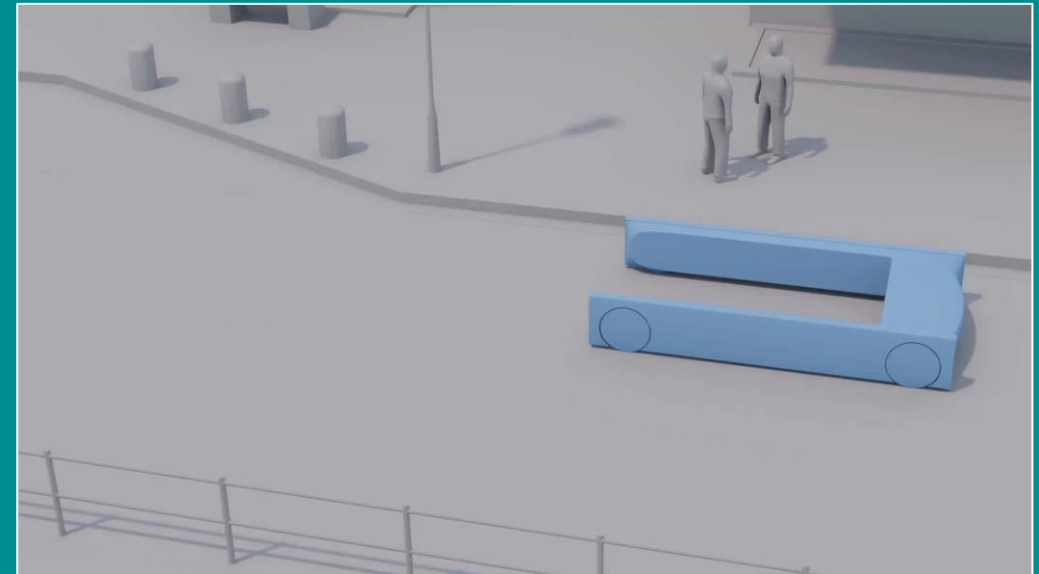
- Driverless, flexible, standardisable
 - Electrical drive system
 - High utilization rates (24/7)
 - No charging break (incl. capsule battery)
- Highly economic

Business model e.g. PT operator ^[1]

- Procurement driveboards + „PT“-capsule
 - Flexibilisation of offer (e.g. Schorndorf ^[2])
 - Outside peak time: Rental / XaaS
Driveboard to parcel service provider
- Cost reduction + additional income

[1] Public Transport

[2] <http://www.reallabor-schorndorf.de>

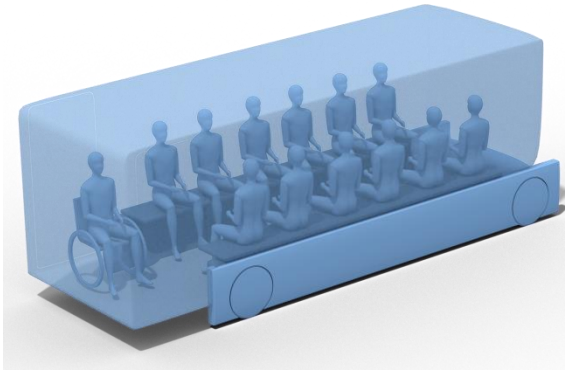


Mounting of a „PT“-capsule

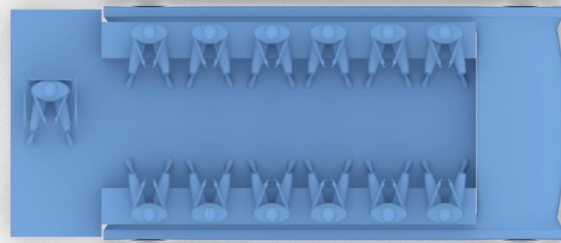
- On-Peak: - supplementary to PT
- e.g. Platoon with buses
- Off-Peak: - Bus stop (shelter)
- Capsule depot (e.g. parking garage)



Capsule variants for passenger traffic



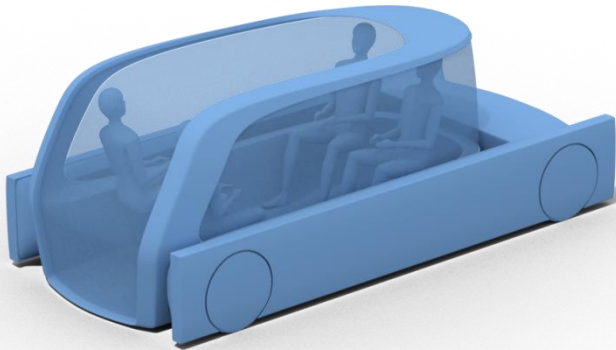
People-Mover



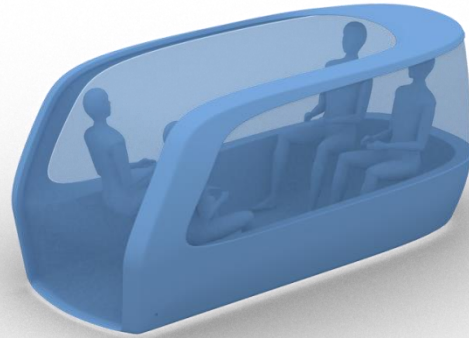
People-Mover seating configuration

Public transport

- Side entry (long capsule)
- Various seat arrangements
- Can be integrated into line operation
- Flexibles call bus system / quarter bus
- New terminal stop charging concept



Private-Capsule



Private-Capsule (parking)

MIV – (Motorised) individual transport

- New interpretation: „standing vehicle“
- Reduced space / parking area
- Futuristic capsule design
- Seat arrangements e.g. Face-2-Face



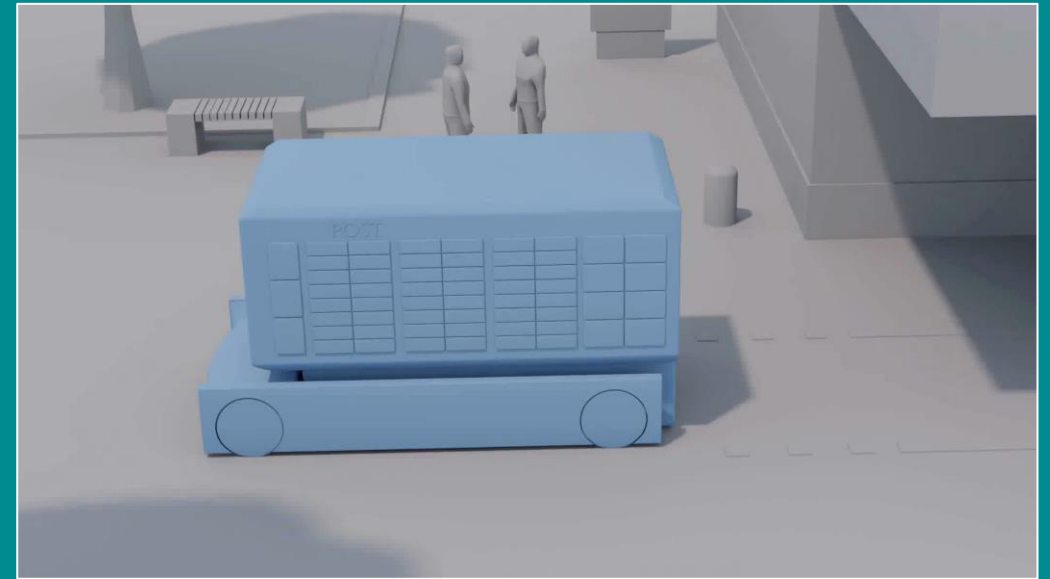
Application example - mobile parcel locker

Driveboard + Capsules

- Driverless, flexible, standardisable
- Electrical drive system
- High utilization rate (24/7)
- No charging break (incl. capsule battery)
- Highly economic

Business model e.g. postal service

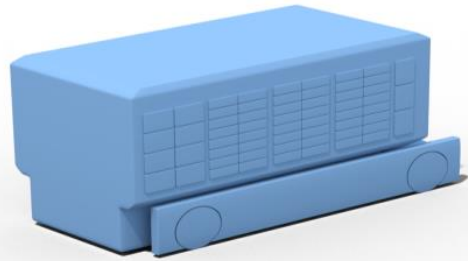
- Procurement driveboards + „Post“-capsule
- 24h fully automate operation;
silent night operation
- Future: capsule-integration in building
- Cost reduction + extended Service



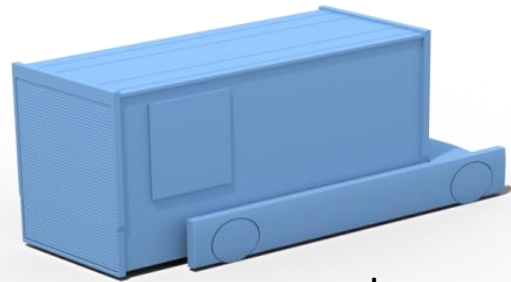
Delivery of a mobile parcel locker

- User scenario: autonomous night delivery
- Power supply: High driving range with combination of capsule and driveboard battery
- Combinable e.g. wit Hub-2-Home

Capsule variants for commercial traffic



mobile parcel station



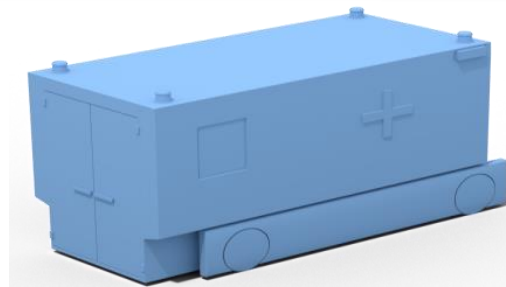
goods capsule

Delivery traffic

- Parcel station, CEP*, end customer
- Supply of warehouse and commerce
- Standard-load carriers (palette, lattice wagon etc.)
- Hub2Hub, Hub2Business, Hub2Home



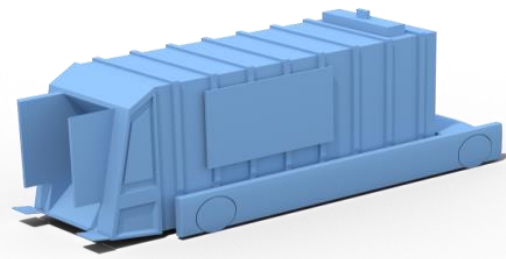
workshop capsule



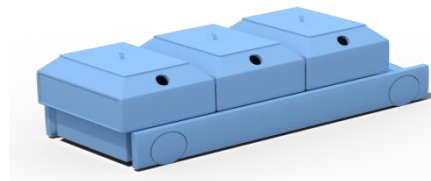
„services-“capsule

Service

- Craft, construction
- Mobile workshop
- Municipal services
- Events



„disposal-“capsule



„recycling-“Capsule



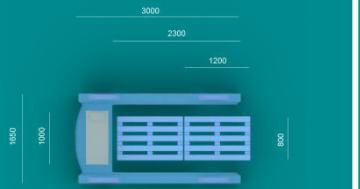

Recycling

- Garbage truck (remote control by operator)
- Recycling
- Cleaning vehicles
- Municipal services

* Courier Express Parcel






U-Shift Vehicle Family

	Large	Medium	Small	X-Small
Type:	„Truck / Bus“	„Minibus“	„Small car“	„Micro-Mover“
Driveboard: (L*W; mm)	5000 x 2500 ^{*1}	4000 x 2000	3000 x 1650	1200 x 1200
Total weight.: (tons)	tbd. << 7.5	3.5 (+ 0,75) ^{*2}	tbd. 1.5	0.6
Range: (km)	200 (∞) ^{*3}	200 (∞) ^{*3}	200 (∞) ^{*3}	100
Max. speed.: (km/h)	80	80	tbd. 100	50
Load: („Pallets“)	6 (8) ^{*4}	3 (4) ^{*4}	2	1/2
(Persons)	12 (16) ^{*4}	10 (12) ^{*4}	2+2	1 +1
Cargo: (tons)	> 2	> 1	> 0.5	> 0.3
				
	<p>*1) Maximum width StVZO *2) incl. battery possible *3) with capsule battery *4) Long capsule (overhang)</p>			



Comparison of modularization strategies

	Mover	Modular Mover	DLR otr-Modular
			
Modularization	platform (ex-factory)	“On the road” (hat-change)	“On the road” (horizontal)
Application	People- or Cargomover	People- or Cargomover	Overall system
Standardization	Individual solutions	Individual solutions	High potential (similar to ISO container)
Payload	Persons or CEP*	Payload area restricted by axles	Unrestricted person- and commercial transport
Loading	Manual	Sideward (limited)	Ground level, very efficient
Module changing	Not intended	Complex; e.g. adjustable system in every hat	Simple, lifting system in driveboard

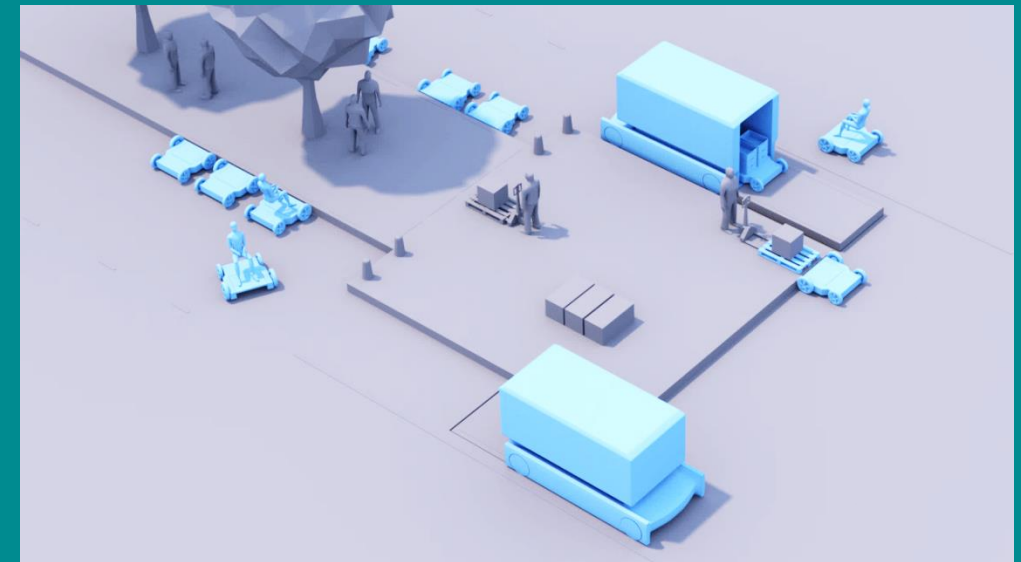
*) Courier Express Parcel



Vision – Urban transport in neighbourhoods

Holistic, integrated solution

- Combination of passenger and commercial transport
- Optimal control of whole traffic
- Traffic equalisation, congestion avoidance
- Intermodal transportability
(road, rail, air, cable etc. – NGT-station)
- Equalisation power supply (capsule charg.)
- Combined business models:
 - PT, commercial transport, sharing, XaaS



City hub for people and logistic

Plug&Drive of driveboards and transport capsules

Modular driveboard-architecture, drive and power modules

Automated vehicle family, capsule variants

Innovative digitalisation / functions (e.g. upgrades „over-the-air“)



Unique vehicle concept with high added value / USPs

U-Shift enables a variety of new vehicle concepts and business models



time

Radical „rethinking“ of today’s highly integrated solutions
Consistent „on-the-road“ modularisation



New products and services for automotive companies
Market opening for non-automotive companies





Thank you very much for your attention.

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