



RESEARCH & DEVELOPMENT

ANDERS NIELSEN, CTO TRATON GROUP | 20-SEP-2018

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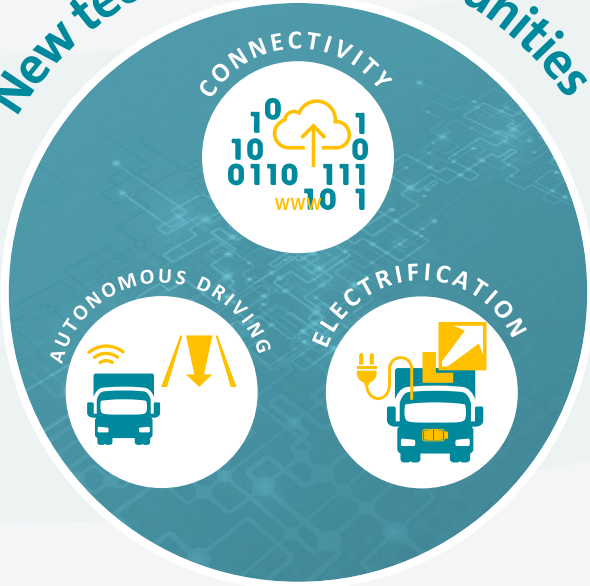
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CREATING A GLOBAL CHAMPION

New technology opportunities

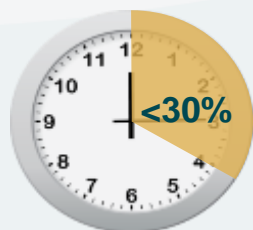


Evolving technology landscape



NEW TECHNOLOGIES ARE ADDRESSING INEFFICIENCIES IN THE INCREASING TRANSPORT ECOSYSTEM, INDICATING SUBSTANTIAL OPTIMIZATION POTENTIAL

Commercial vehicles
in motion less than
30% of the time



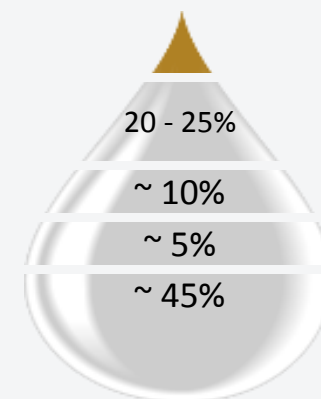
~60% of total length available for additional load



~7% of road
accidents
involve trucks



~5-10% of fuel energy used to transport goods



Moving the base
vehicle and trailer
Driving waste
Truck and trailer loss
Engine efficiency

Better transportation makes a better world

GLOBAL ENGINEERING COMMUNITY

Fully consolidated companies
~7000 R&D employees

Associates¹ Strategic partner²

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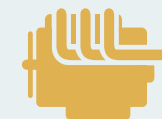
1 Associates are Navistar and Sinotruk, in which TRATON has a minority equity stake (Navistar c. 17%, Sinotruk 25% +1 share) 2 Strategic partner is Hino, with whom TRATON has entered into a strategic partnership in 2018

TANGIBLE SYNERGIES WITHIN ENGINEERING AND PRODUCT DEVELOPMENT



1

Joint powertrain



2

Modularization and components



3

New technologies



LEAD ENGINEERING IN JOINT POWERTRAIN PLATFORM

Time to market

State of the art product properties

Higher resource efficiency and lower product cost

15-16l



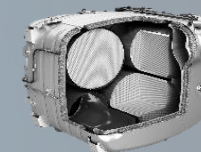
11-13l



5-9l



Aftertreatment
system



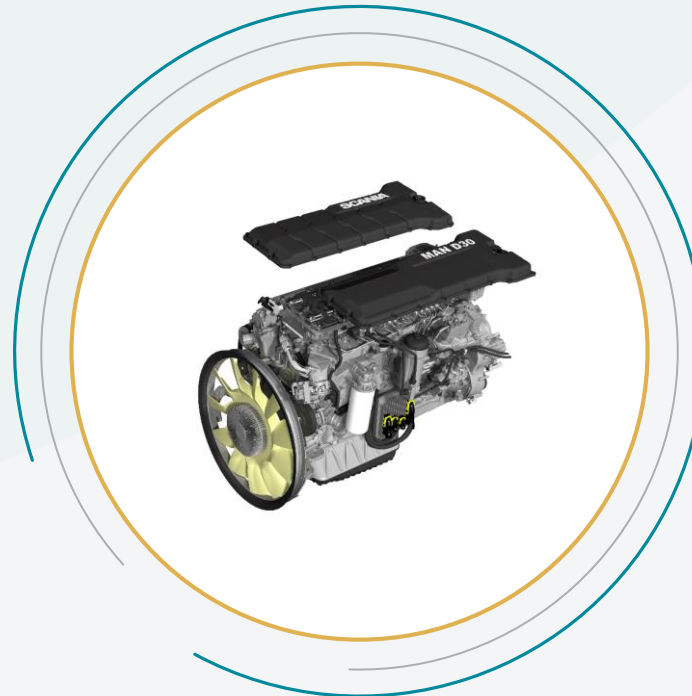
Axles



Transmission



ONE EXAMPLE OF JOINT POWERTRAIN



Common Base 13L Engine (CBE) – our jointly developed HD powertrain platform

- More than 50% Brake Thermal Efficiency
- Globally ready for future emission legislations
- Expected to be installed in >50% of alliance's HD trucks¹ per year from 2025 onwards

¹ Roll-out across TRATON GROUP brands

MODULARIZATION AND COMPONENTS

What is the objective?



We want to **drive synergies** for the brands with maintained or improved **customer value** by

- **Reducing complexity** via common components
- **Reducing material cost**
- **Optimizing customer offer** through refined set of **performance steps**
- **Free-up R&D resources** to invest in future technologies

Several waves launched



- **Wave 1:**
Urea tanks, batteries ...
- **Wave 2:**
Propeller shaft, steering system ...
- **Wave 3:**
Brake system, air compressors ...

Urea tanks



Potential opportunities of ~10 % in product cost savings

- **Harmonization** of production technology
- Market **benchmarking** and **comparison of price levels**
- **Portfolio** overlap **investigation** and prioritization

MODULARIZATION AND COMPONENTS

Common Layout Team working with:



Customer need – GTW, rolling resistance, start/stop frequency, topography etc.



Well balanced performance steps – derived from the customer needs



Standardized interfaces – modular kit with clear interfaces



Global organization from all brands

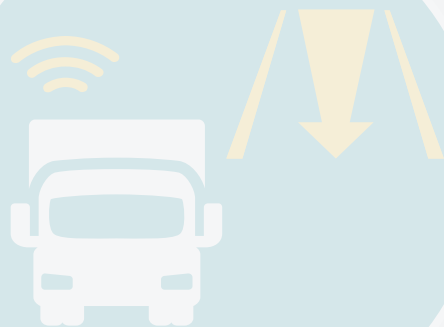
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WE ARE DRIVING THE DISRUPTIVE TRENDS

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AUTONOMOUS DRIVING



CONNECTIVITY



ELECTRIFICATION



WHAT THE FUTURE MIGHT LOOK LIKE

V2V and V2X communication

Efficiency of entire ecosystem
Open, manufacturer-independent and cloud-based platform
Improve profitability and competitiveness



MORE THAN 450K CONNECTED TRATON VEHICLES ON THE ROAD TODAY



TRATON has a strong position in connected fleet ...

approx. 450k connected vehicles

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Navistar's OnCommand Connection
expected to join group solutions in 2019

Enabling >900k connected vehicles



Scania ONE
launched



All new medium- and
heavy duty (Euro6) trucks
in Europe equipped with
RIO telematics box



Caminhões
Ônibus

Launch of RIO
planned for 2019

... strengthened by several investments and partnerships
with innovative technology companies



Offers connectivity
environment, went live in 2017

Exemplary partners:

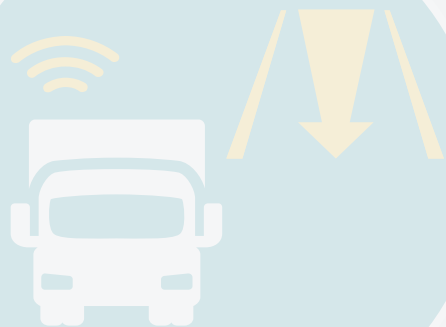


Connectivity enabler for autonomous driving

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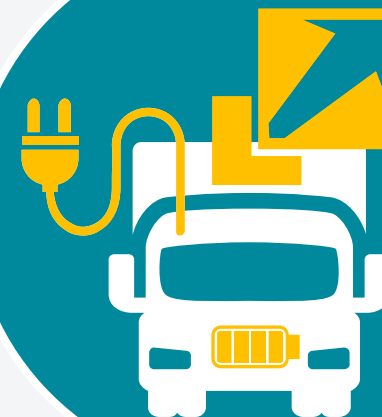
AUTONOMOUS DRIVING



CONNECTIVITY



ELECTRIFICATION



WHAT THE FUTURE
MIGHT LOOK LIKE



ELECTRIFICATION ROADMAP

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TEST FLEETS TODAY

2020+



MAN eTruck



SCANIA PHEV Truck



SCANIA Pantograph Truck



VW
Caminhões Ônibus
E-Delivery



Various other
test fleets



SCANIA

BEV buses



MAN



Avoiding double work – Common development

Drivetrains

Central, Mild hybrids, High Speed Motors, eAxles

Energy storage

Energy optimized, Power optimized

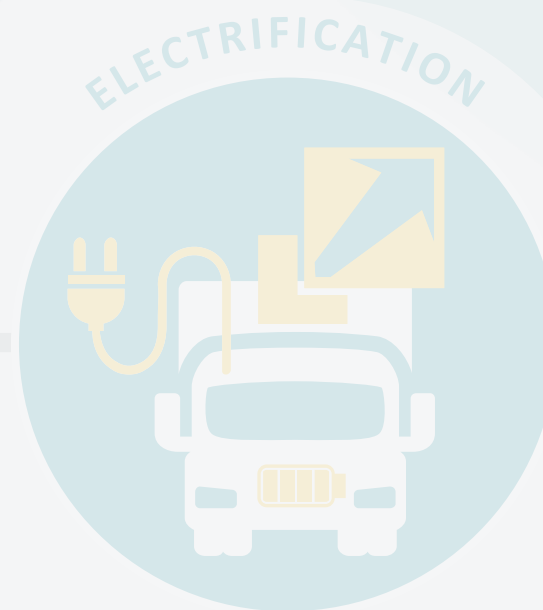
Charging

Rail on roof, On board

Auxiliaries and Cooling/HVAC

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WHAT THE FUTURE MIGHT LOOK LIKE



AUTONOMOUS DRIVING ROADMAP

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TEST FLEETS TODAY

2020+

2025+



**Construction
Signaling Vehicle**



**Autonomous
Mining Vehicle**



**Platooning A9
DB Schenker**



**Various other
test fleets**

Avoiding double work – Common development

ADC

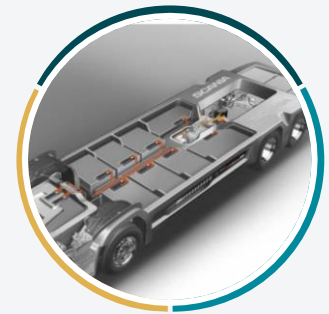
ADAS Domain Controller

Sensor platform

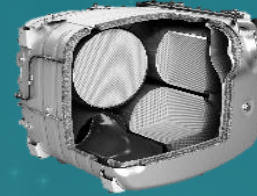
Radar sensors, cameras, lidars, automation
architecture

Functions

Traffic Jam Pilot, Autopilot for Highway, Platooning



Common conventional Powertrain



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Common future technology platform - ACE

