



RESEARCH & DEVELOPMENT

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

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CREATING A GLOBAL CHAMPION

TRATON GROUP

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



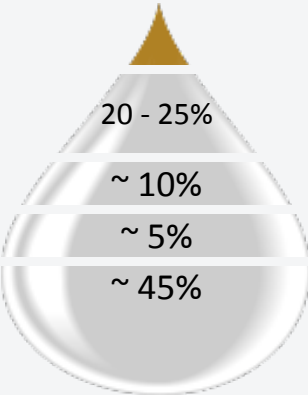
~60% of total length available for additional load



~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

SOURCE: TRATON Group estimates

GLOBAL ENGINEERING COMMUNITY

Fully consolidated companies
~7000 R&D employees

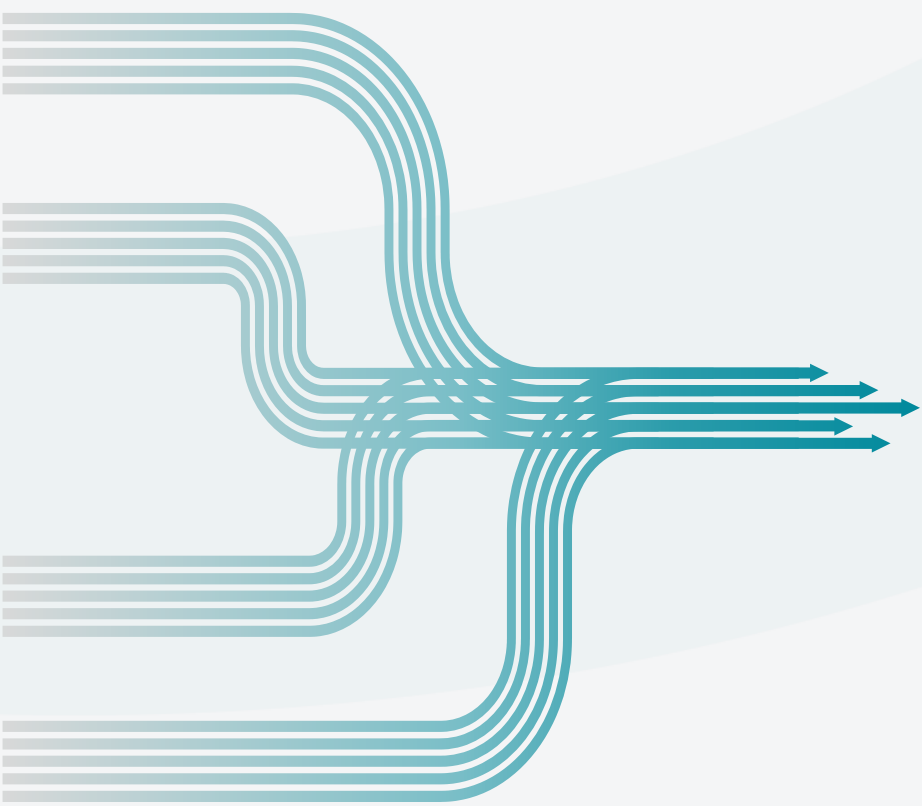
Associates¹ Strategic partner²

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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



Joint powertrain



Modularization and components



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



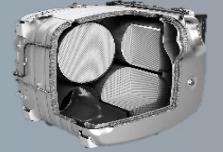
11-13l



5-9l



Aftertreatment system



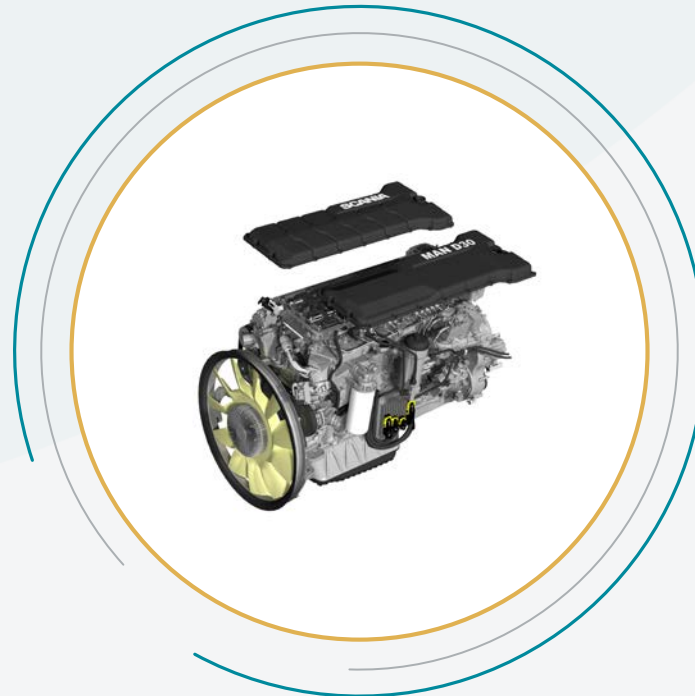
Axles



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 Per year from 2025 onwards, incl. Navistar and excl. Sinotruk and Hino

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



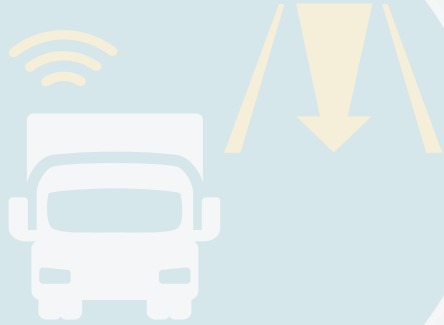
Global organization from all brands

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WE ARE DRIVING THE DISRUPTIVE TRENDS

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



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

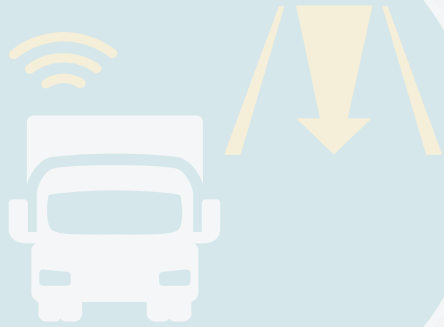
Exemplary partners:



Connectivity enabler for autonomous driving

WE ARE DRIVING THE DISRUPTIVE TRENDS

AUTONOMOUS DRIVING



CONNECTIVITY



ELECTRIFICATION



WHAT THE FUTURE
MIGHT LOOK LIKE



ELECTRIFICATION ROADMAP

TEST FLEETS TODAY

2020+



MAN eTruck



SCANIA PHEV Truck



SCANIA Pantograph Truck



Caminhões Ônibus E-Delivery



Various other test fleets

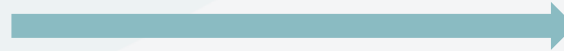


SCANIA

BEV buses



MAN



Avoiding double work – Common development

Drivetrains

Central, Mild hybrids, High Speed Motors, eAxles

Energy storage

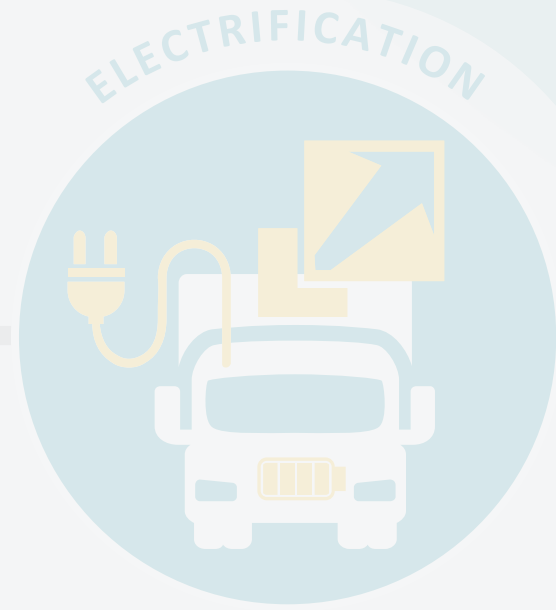
Energy optimized, Power optimized

Charging

Rail on roof, On board

Auxiliaries and Cooling/HVAC

WE ARE DRIVING THE DISRUPTIVE TRENDS



WHAT THE FUTURE MIGHT LOOK LIKE



AUTONOMOUS DRIVING ROADMAP

TEST FLEETS TODAY

2020+

2025+



Construction Signaling Vehicle



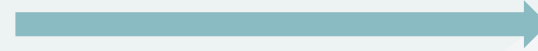
Autonomous Mining Vehicle



Platooning A9 DB Schenker



Various other test fleets



Avoiding double work – Common development

ADC

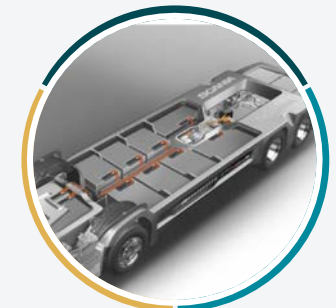
ADAS Domain Controller

Sensor platform

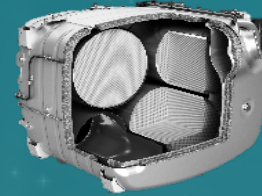
Radar sensors, cameras, lidars, automation architecture

Functions

Traffic Jam Pilot, Autopilot for Highway, Platooning



Common conventional Powertrain



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Common future technology platform - ACE

