AEROFLEX

The AEROFLEX project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 769658

AEROFLEX

Ben Kraaijenhagen

Dr. Agnes Eiband

Pierre de Rochambeau

Andreas Lischke

Gafur Zymeri

Christoph Jessberger

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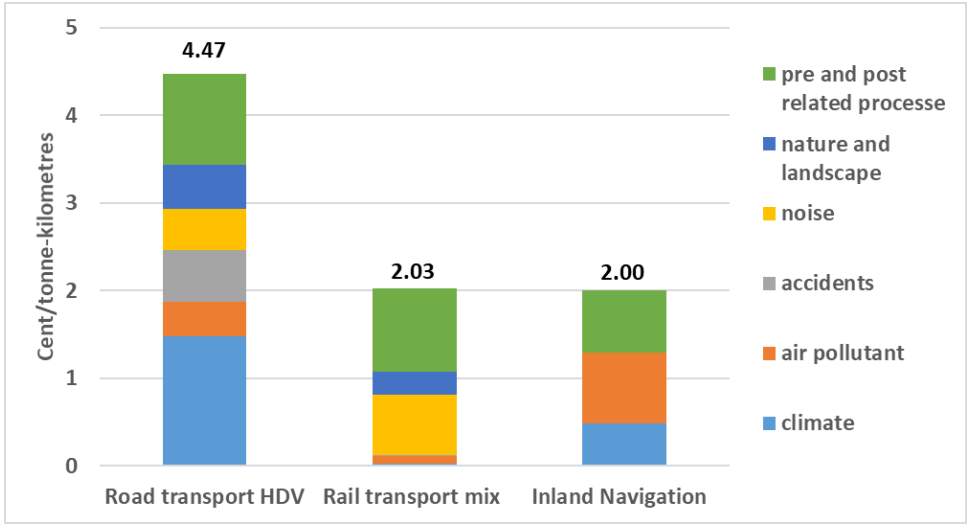
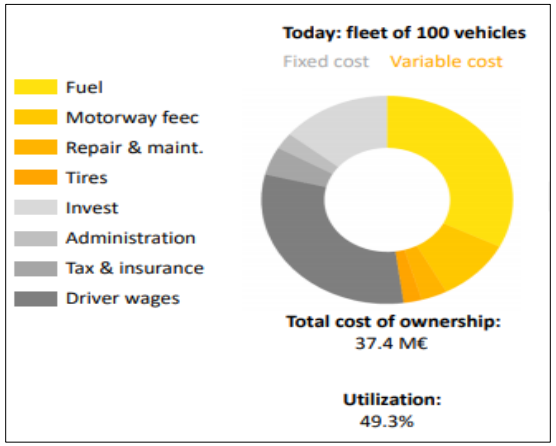
- CO2 emissions and impact on climate
- Road accidents, injuries and fatalities
- TCO and vehicle kilometers per ton freight
- Cost pre & post related processes





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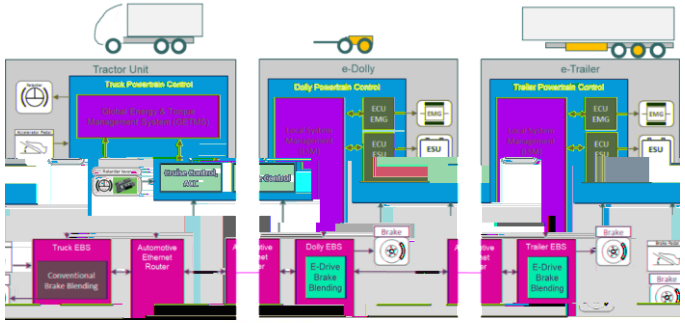
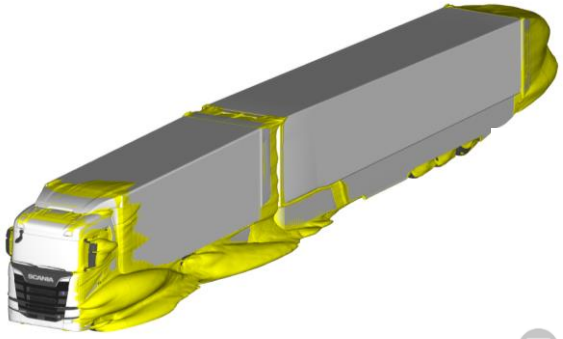
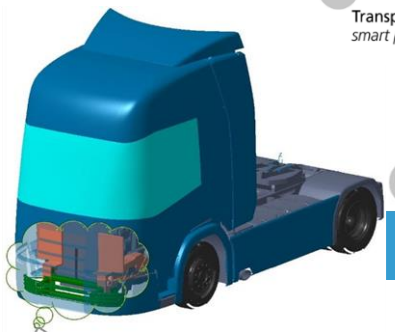
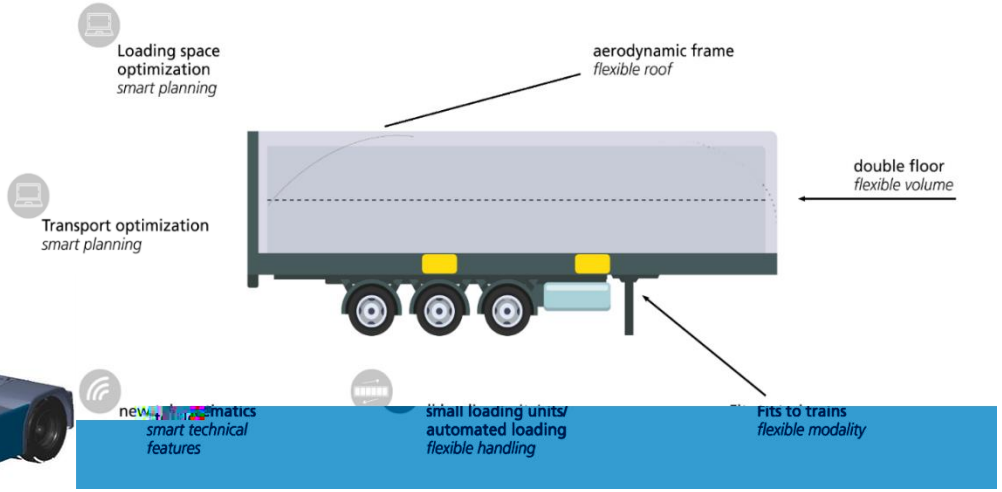
- Energy Management Powertrain
- Smart Steerable Dolly
- Active Aerodynamic Devices
- Smart Loading Units and Tools
- Front-end design









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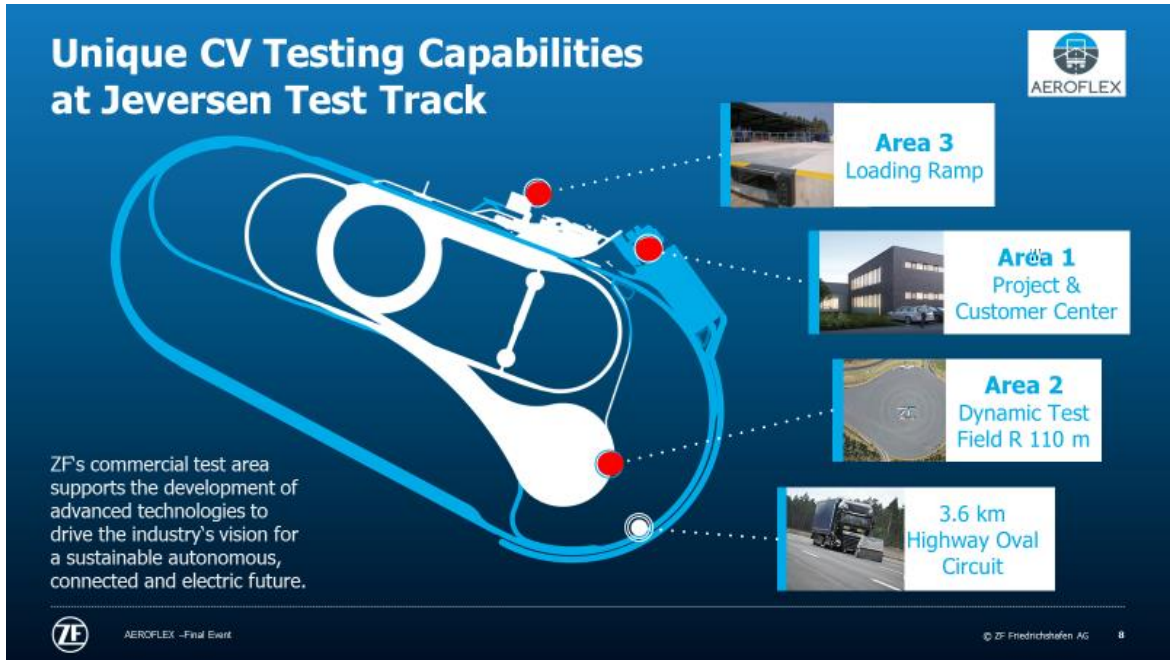

- **SAVE THE DATE**
  Final event, 28 September 2021
  Full day hybrid event and interaction

- **Registration open**

- **Go to** _____

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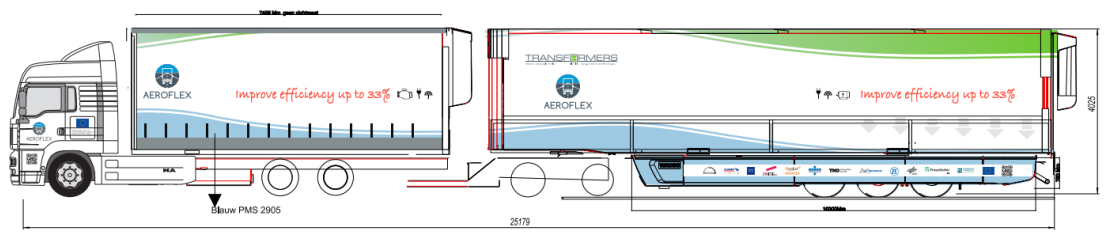
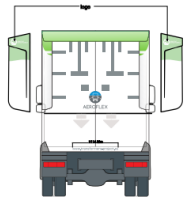
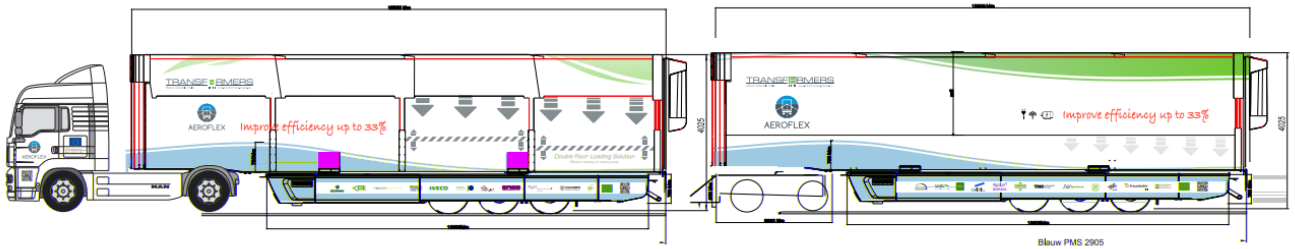

AEROFLEX
Improve efficiency up to 33%
TRANSFRIGO
AEROFLEX
Improve efficiency up to 33%
Blauw PMS 2905
25179
4025




TRANSFRIGO
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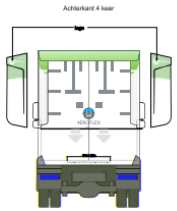

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Hybrid Electric, distributed powertrain:

- Environmental benefits for trucking

Steerable e-dolly:

- Autonomous or remote maneuvering of loading units in logistics nodes
- Drivers can focus on driving

- Storing of separate electric power at the e-dolly
- Less relative fuel consumption per cargo unit (e.g., per tkm)
- Logistics processes on logistics yards (e.g., Logistics hubs, intermodal terminals or big warehouses) could be optimized
- Parking of trailers on limited parking spaces (e.g., at motorway parking places or in terminals) could be efficiently organized
- Less staff required due to the implementation of autonomous or remote maneuvering processes

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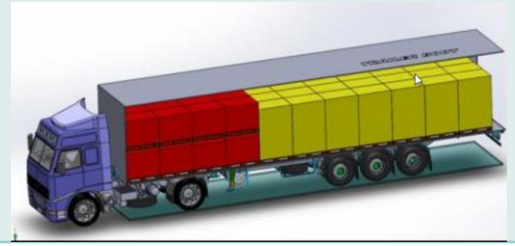
- Higher Efficiency in planning: optimize use of loading space (volume and weight)
- Energy efficient trucking (trips and tours): less relative CO_2 emissions per transported cargo unit
- Addressing modular concepts and a digital transport process planning (e.g., by using artificial intelligence)

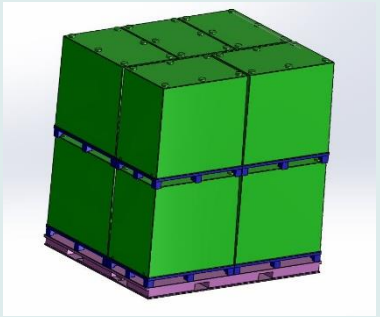
Aerodynamic design of the full vehicle

- Less fuel consumption per cargo unit

Modular, adaptable loading unit

- Perfectly in line with Physical Internet concept
- Optimization with puzzle software
- Robust on all transport modes





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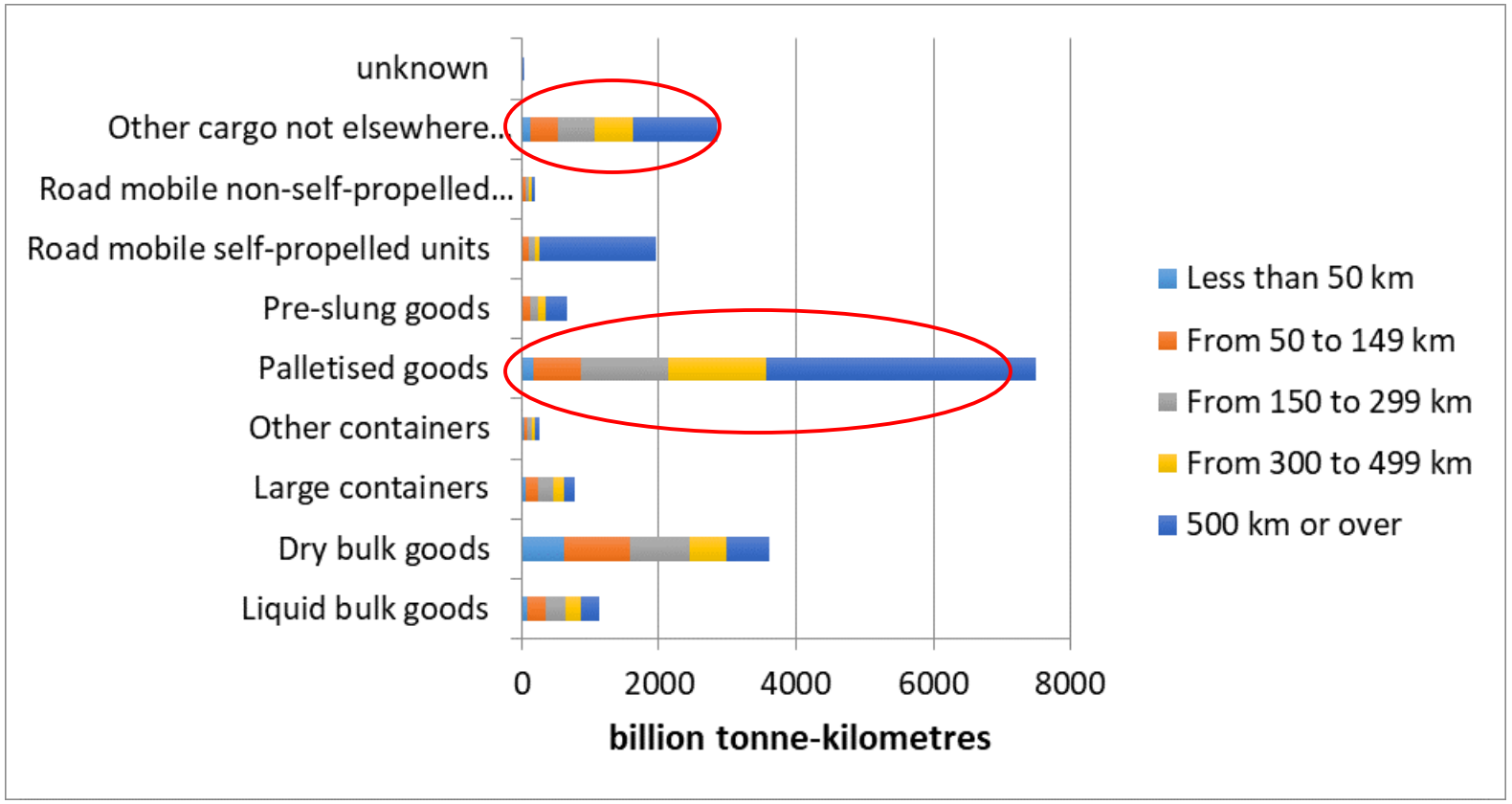
unknown
Other cargo not elsewhere...
Road mobile non-self-propelled...
Road mobile self-propelled units
Pre-slung goods
Palletised goods
Other containers
Large containers
Dry bulk goods
Liquid bulk goods
0
2000
4000
6000
8000
billion tonne-kilometres
Less than 50 km
From 50 to 149 km
From 150 to 299 km
From 300 to 499 km
500 km or over

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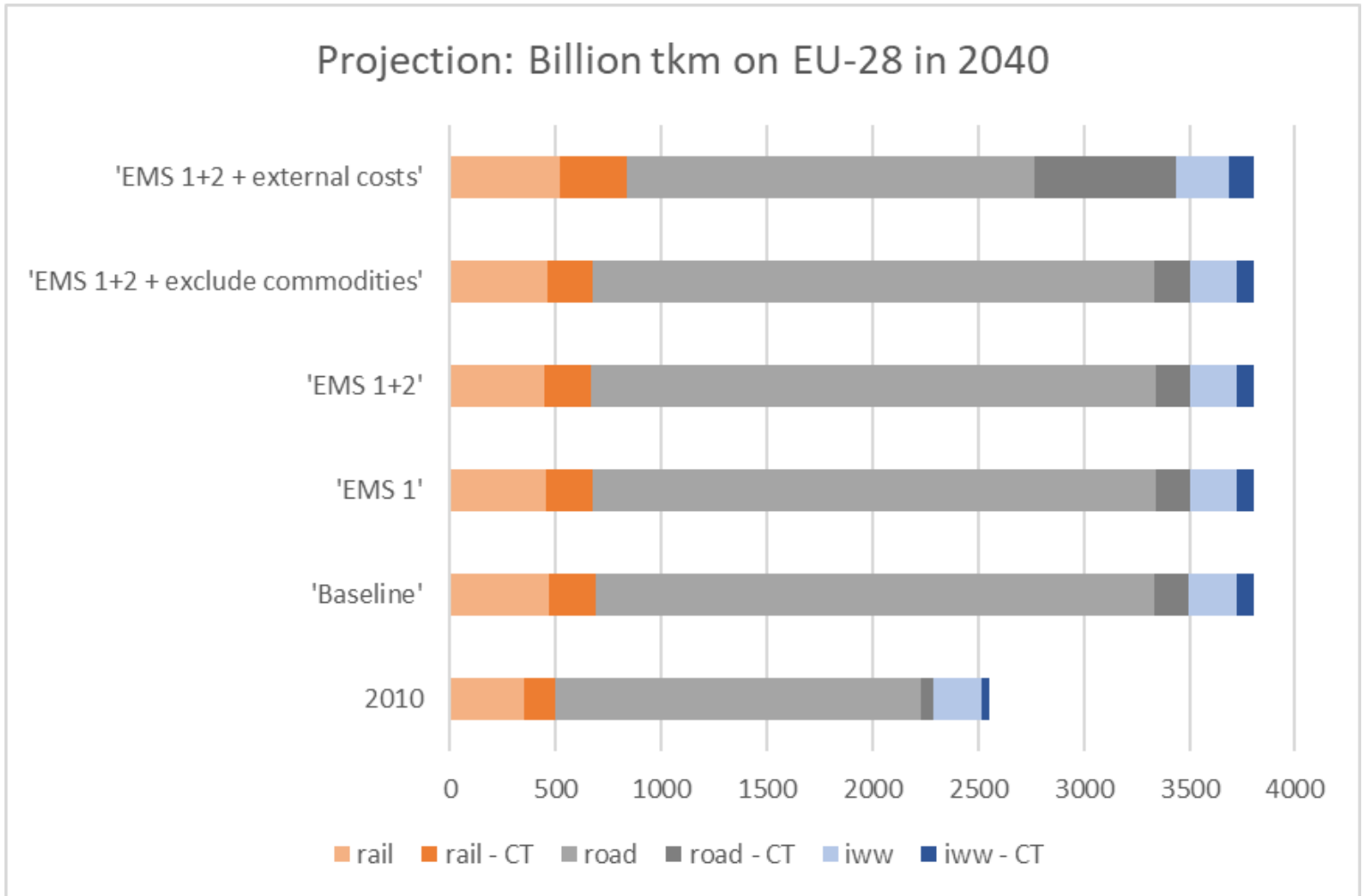
Projection: Billion tkm on EU-28 in 2040
'EMS 1+2 + external costs'
'EMS 1+2 + exclude commodities'
'EMS 1+2'
'EMS 1'
'Baseline'
2010
0
500
1000
1500
2000
2500
3000
3500
4000
rail
rail - CT
road
road - CT
iww
iww - CT

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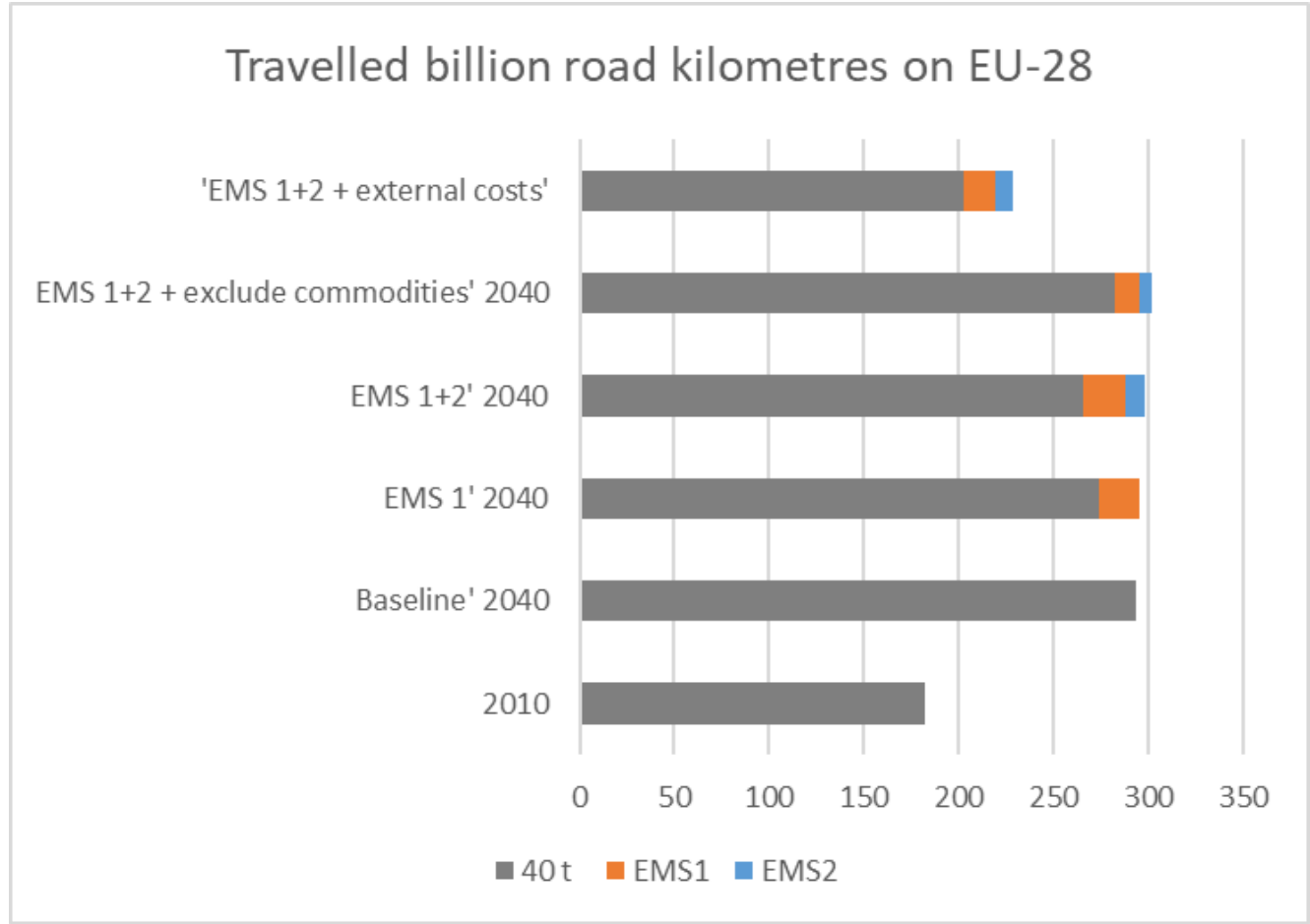
Travelled billion road kilometres on EU-28
'EMS 1+2 + external costs'
EMS 1+2 + exclude commodities' 2040
EMS 1+2' 2040
EMS 1' 2040
Baseline' 2040
2010
0
50
100
150
200
250
300
350
40 t
EMS1
EMS2

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CO_2 emissions on road, in Mio. t (ttw, Diesel fuel)
'EMS 1+2 + external costs'
EMS 1+2 + exclude commodities' 2040
EMS 1+2' 2040
EMS 1' 2040
Baseline' 2040
2010
0
50
100
150
200
250

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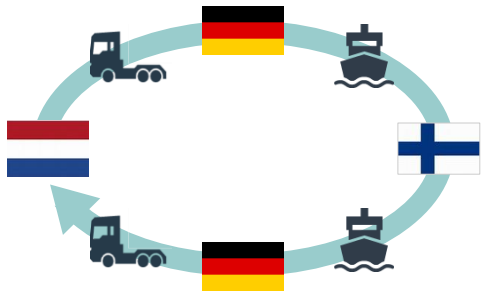
- CO_2 emission reduction potential of -25,81% (-129.6 kg CO_2)



- CO_2 emission reduction potential of -32,44% (-72.0 kg CO_2)

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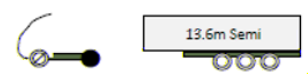
	 45ft 45ft	
	 7,825m 7,825m	
	 45ft 20ft	
	 14.92m Semi	
	 7,825m 7,825m	
	 20ft 45ft	
	 13.6m Semi	

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-
  -
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topics	specifics	Comments

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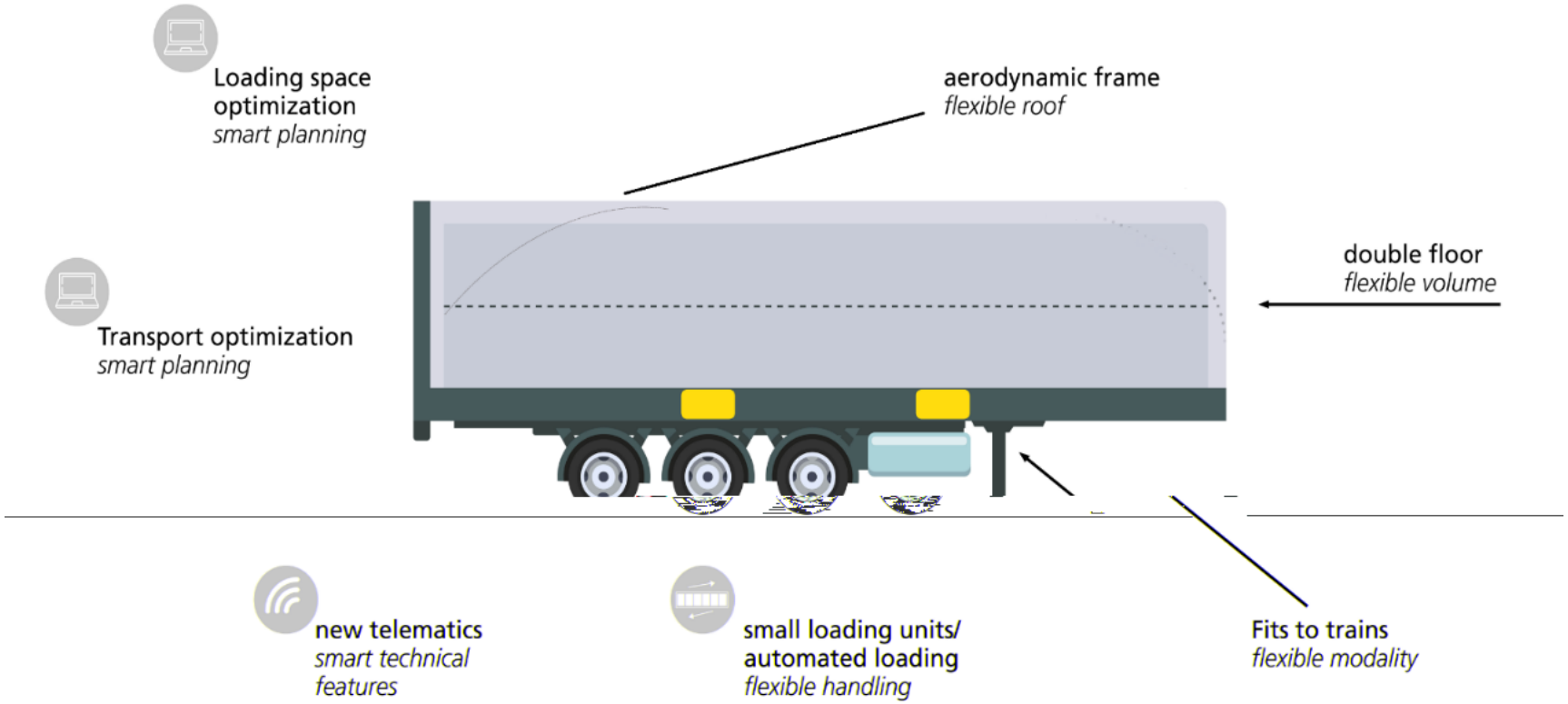
Loading space optimization
smart planning
aerodynamic frame
flexible roof
double floor
flexible volume
Transport optimization
smart planning
new telematics
smart technical features
small loading units/ automated loading
flexible handling
Fits to trains
flexible modality

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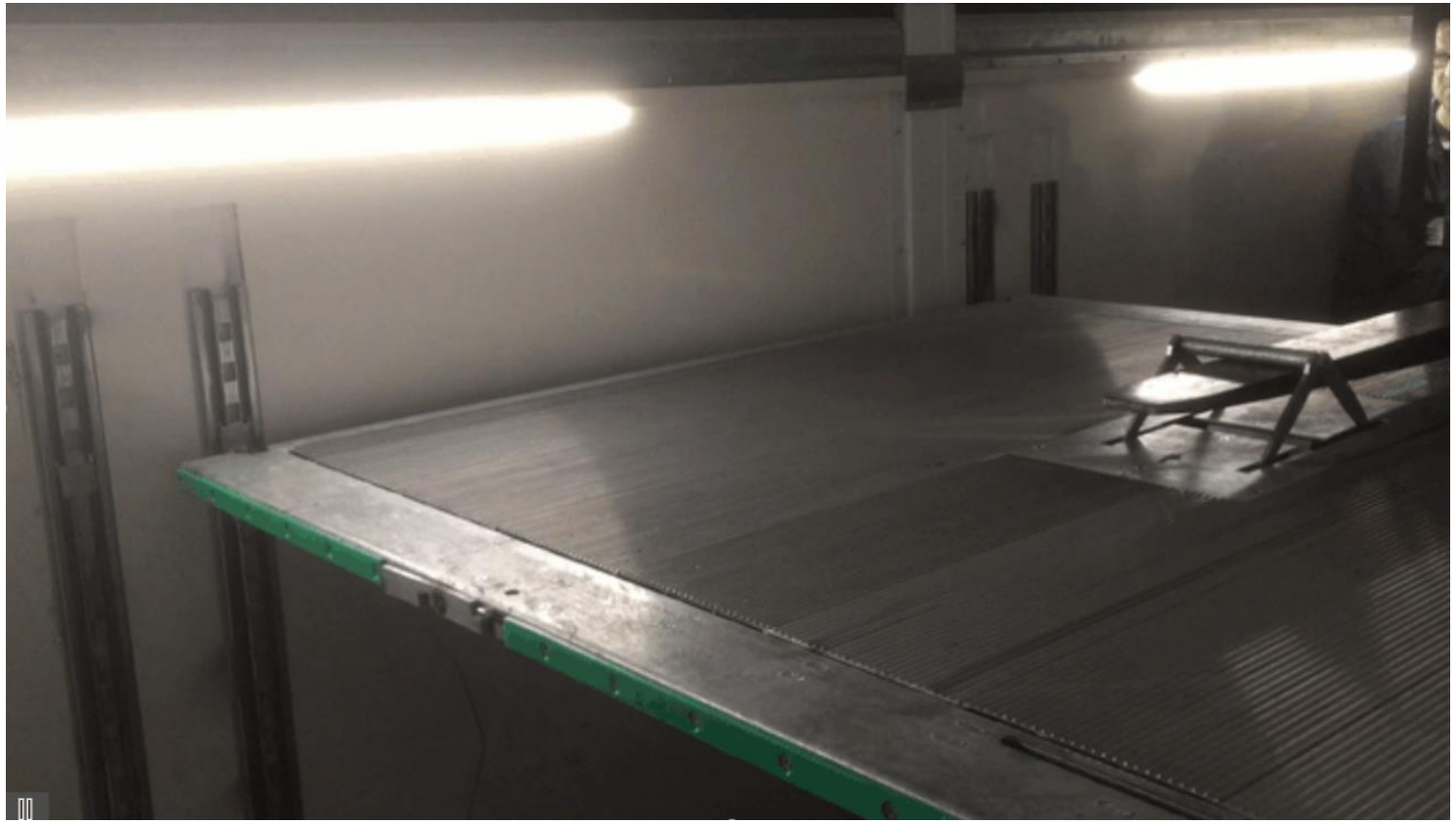

Source: VanEck

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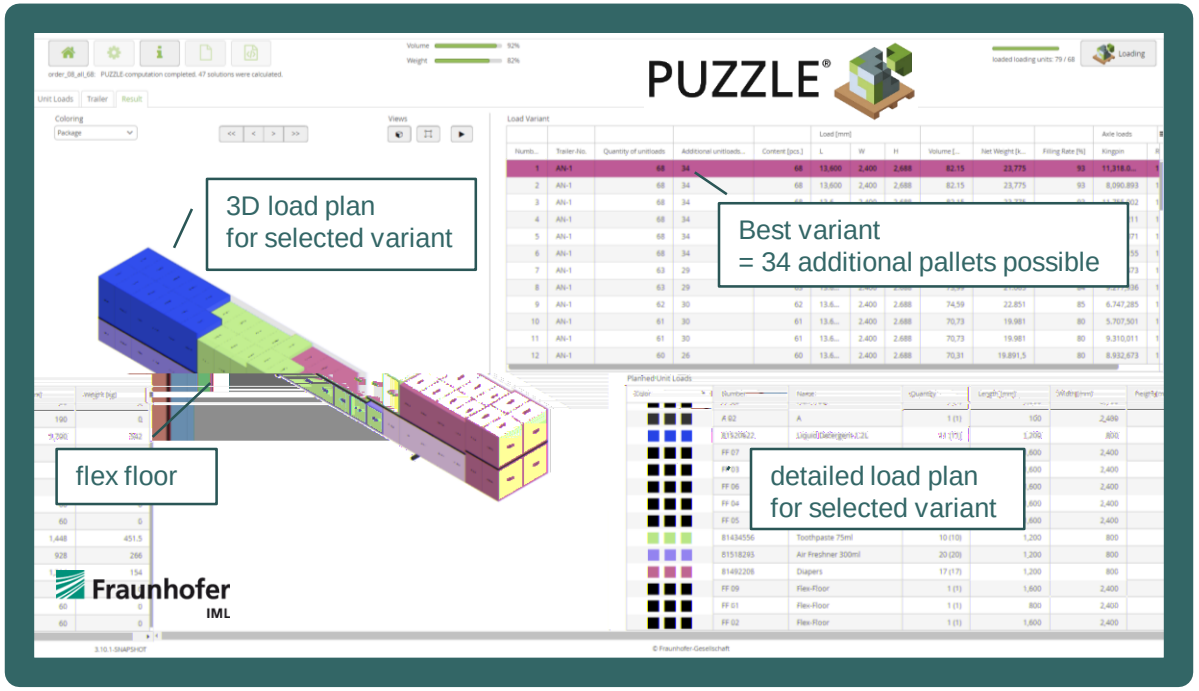
Example



Source: Fraunhofer IML

Test result 2020

Demonstration at P&G use-case within AEROFLEX project

38% higher filling rate
+
Fast and easy planning

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Loading plan (3D)

Loading plan (table)

other loading unit types

other loading equipment

Which functions?

Future ideas

Double-floor trailer

Max. weight check

Weight balancing check

Combination with route planning

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EFFICIENCY

transparency
tracking cargo
trailer

SECURITY

affordable

reliable

INTEGRITY

Continuous monitoring
new norm

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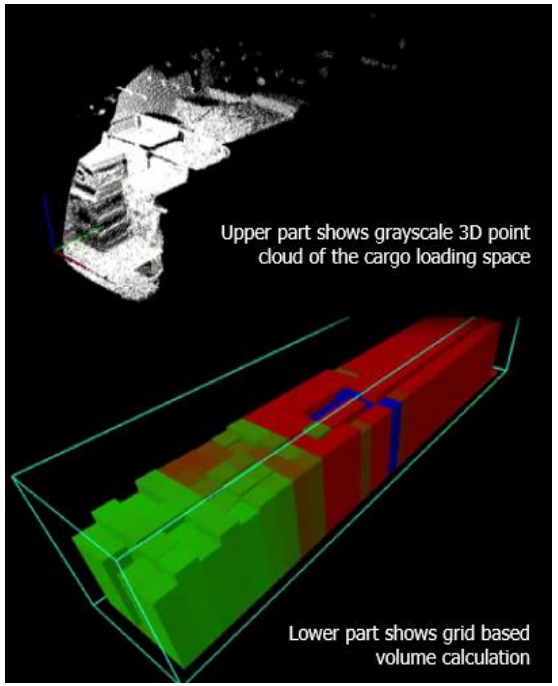
Description

- **Depth-aware sensor** provides real time cargo information to the driver & the fleet manager
- Mounted inside the trailer and **protected** from load/unloading bumps
- Identifies inefficiencies and risks

Beneficiary

- Carriers
- Shippers
- Control Rooms

Visual



Competitive Environment

First cargo systems available with simple cargo tracking technology

No system launch

Technology readiness and system complexity are **delaying** implementation of **advanced solutions**

Value to customer

- **Efficiency** : improves load/unload process, measures performances and avoids down time
- **Security**: detects intruders and provides images
- **Integrity**: detects loose cargo

Project Maturity

TRL 5: **Prototype in R&D** state

First Proof of Concept completed

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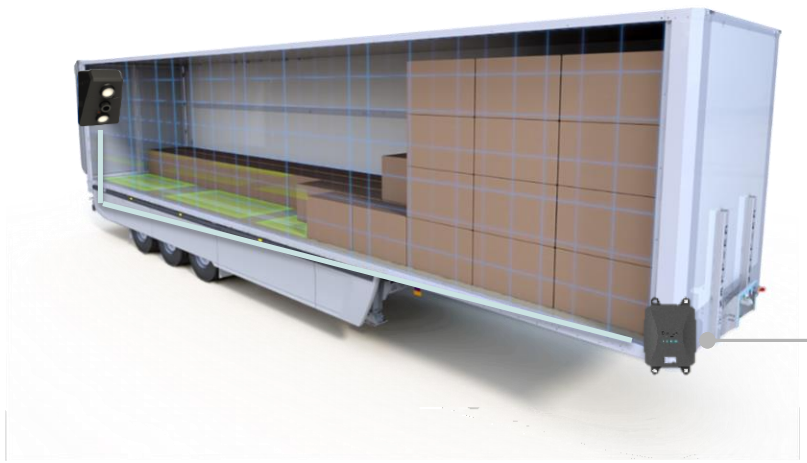

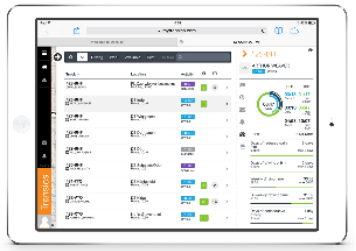

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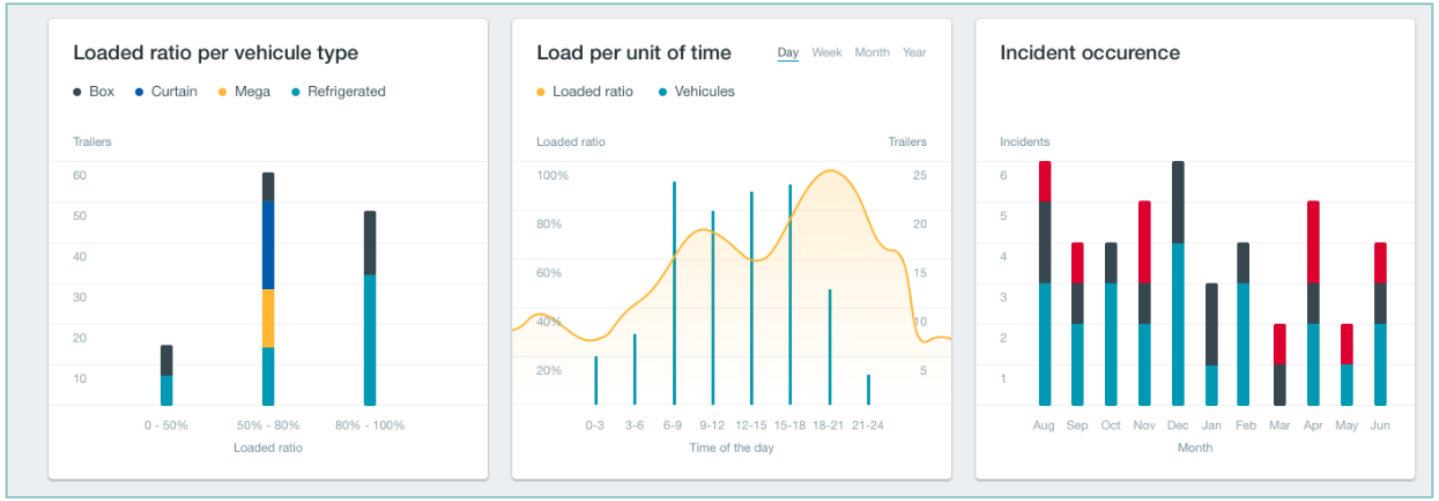
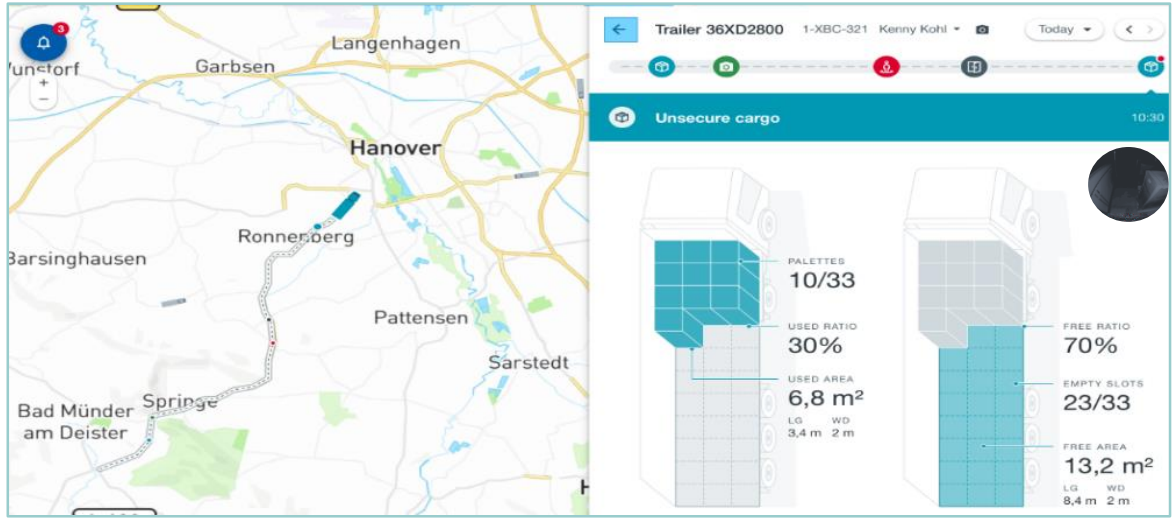
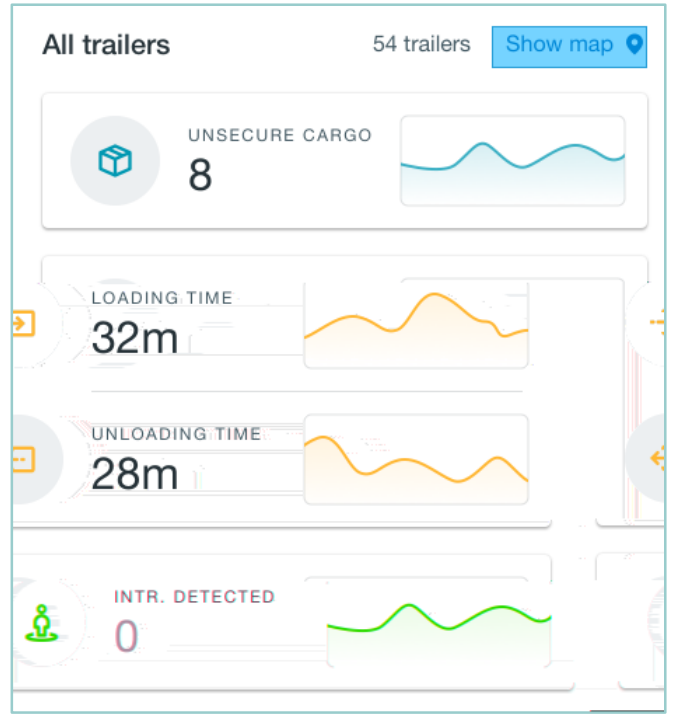

Loaded ratio per vehicule type
Box
Curtain
Mega
Refrigerated
Trailers
60
50
40
30
20
10
0 - 50%
50% - 80%
80% - 100%
Loaded ratio
Load per unit of time
Day
Week
Month
Year
Loaded ratio
Vehicules
Loaded ratio
Trailers
100%
80%
60%
40%
20%
25
20
15
10
5
0-3
3-6
6-9
9-12
12-15
15-18
18-21
21-24
Time of the day
Incident occurence
Incidents
6
5
4
3
2
1
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Month


Garbsen
Langenhagen
Hanover
Ronnenberg
Barsinghausen
Pattensen
Sarstedt
Springe
Bad Münder
am Deister
Trailer 36XD2800
1-XBC-321
Kenny Kohl
Today
Unsecure cargo
10:30
PALETTES
10/33
USED RATIO
30%
USED AREA
6,8 m²
LG 3,4 m
WD 2 m
FREE RATIO
70%
EMPTY SLOTS
23/33
FREE AREA
13,2 m²
LG 8,4 m
WD 2 m


All trailers
54 trailers
Show map
UNSECURE CARGO
8
LOADING TIME
32m
UNLOADING TIME
28m
INTR. DETECTED
0

?

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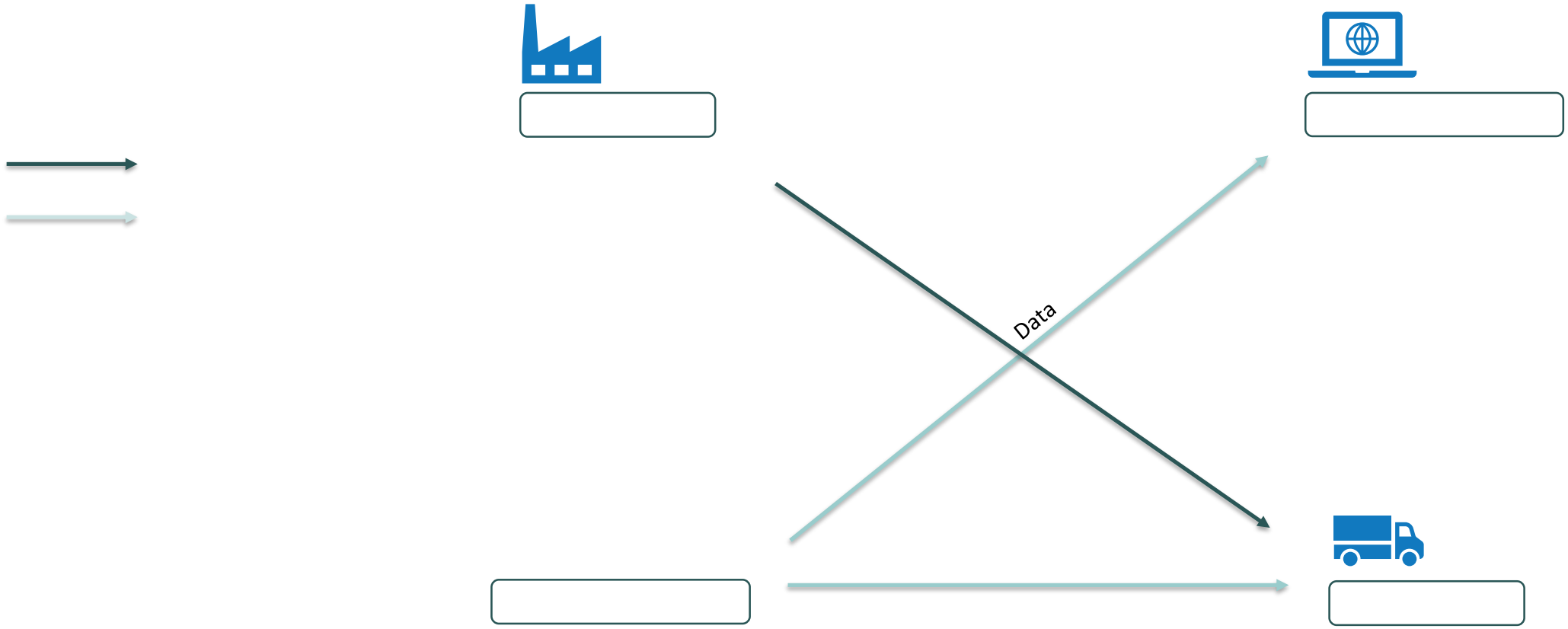

Dilemma

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Pre-defined
X
X
X
X
X

Outcome Q&A
X
X
X
x

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Who	Topics	Specifics/question	Comments
Agnes - Andreas	Modeling		
Pierre - Christoph	Use case		
Gafur – Agnes	PUZZLE		
Andreas - Pierre	Market		
Christoph - Gafur	CVD		

Presentation	18-19hr
Return	20-21hr