

Connecting and Automating Trucks



Working with the industry to achieve
new levels of Safety, Fuel Efficiency
and Operational Efficiency



Market Trend: Accelerating Global Activity in Truck Platooning Builds on Decades of R&D



EU - Platooning Challenge – 2016



Japan - ENERGY ITS 2009-12



EU (Sweden) - SARTRE 2009-Present



Canada - PIT 2009



Germany – KONVOI 2005-09



US – PATH, NREL, etc. '90s and ongoing

Freight Trucking Scale and Major Pain Points

US Freight Trucking: \$700 Billion in Revenues

- Fuel Cost: **\$100+ Billion for nearly 30 billion gallons of fuel**
 - **34%+ Operating Costs**
- Accident Cost: **\$90+ Billion and 113 million gallons of fuel**
- Industry Net Profit: **3%**

- Preventing Accidents
- Saving Fuel
- Improving Mobility
- Improving Decisions



Enhanced
Fleet Economics
& Safety

Truck Platooning is increasingly widely supported

Companies Involved in Near Commercial and/or Prototype Systems:



A PACCAR COMPANY



A PACCAR COMPANY



Investment in Peloton Technology from Industry Leaders

Trucking Industry

VOLVO

DENSO



MAGNA

Technology and Energy



NOKIA



Financial Investors

Lytix



band
OF ANGELS

Videos

These can be watched after the presentation.

- Platooning Experience Video:

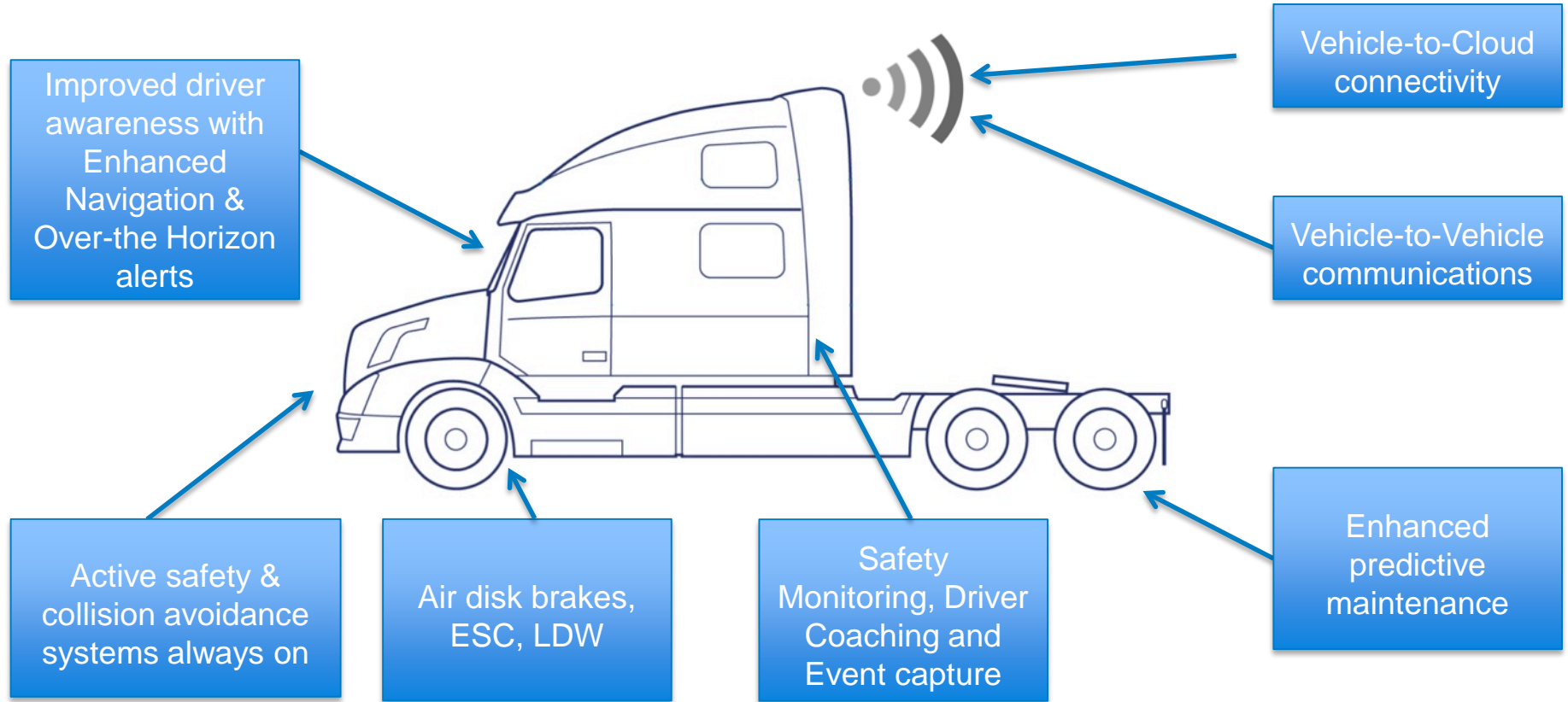
<https://vimeo.com/155164547>

- Peloton Platooning System Explained:

<https://vimeo.com/pelotontech/review/146972113/fc319cdb6b>

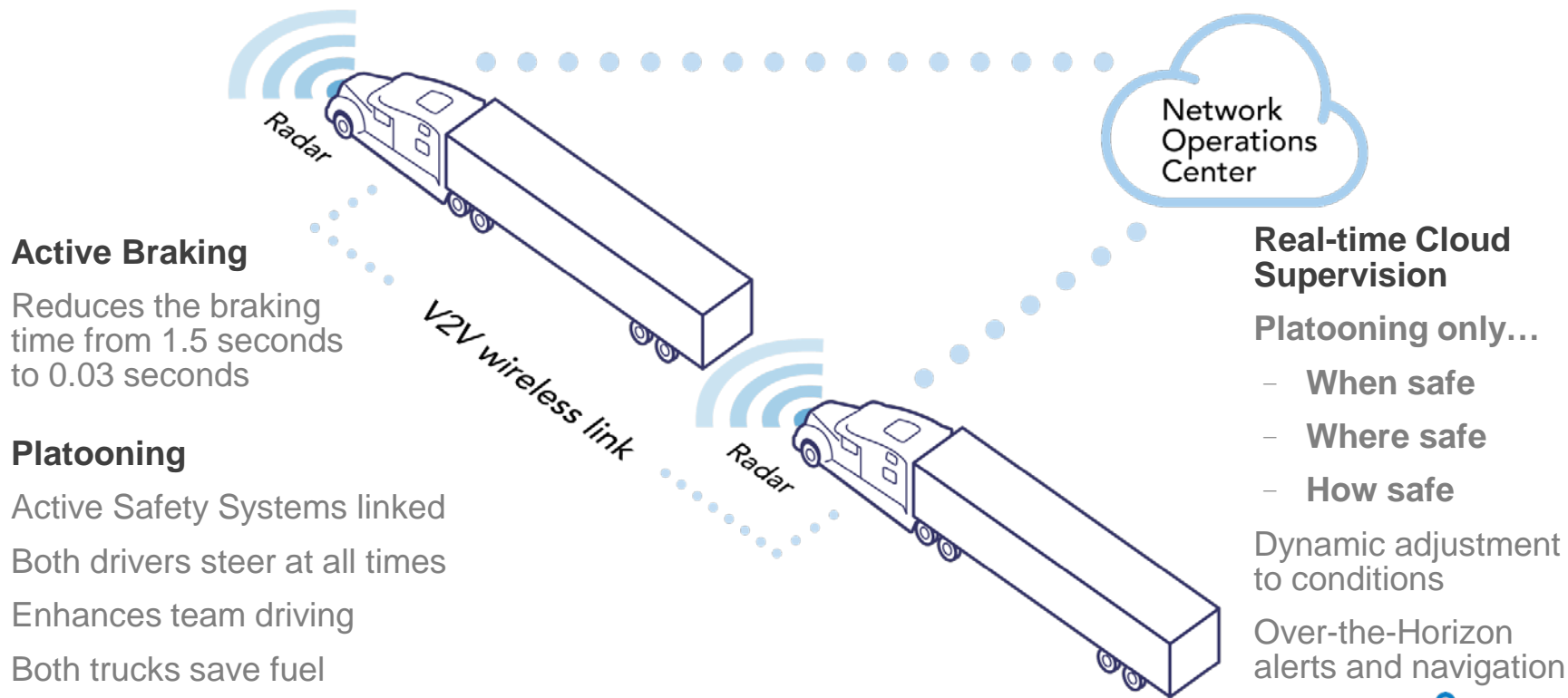


We Start By Making Individual Trucks Safer at All Times



Peloton Driver-Assistive Truck Platooning System

Improving Safety. Empowering Drivers. Connecting Trucks.



Only Pairs of Trucks, Not Longer Chains



Drivers in Command & Engaged in Steering At All Times



Front Driver:

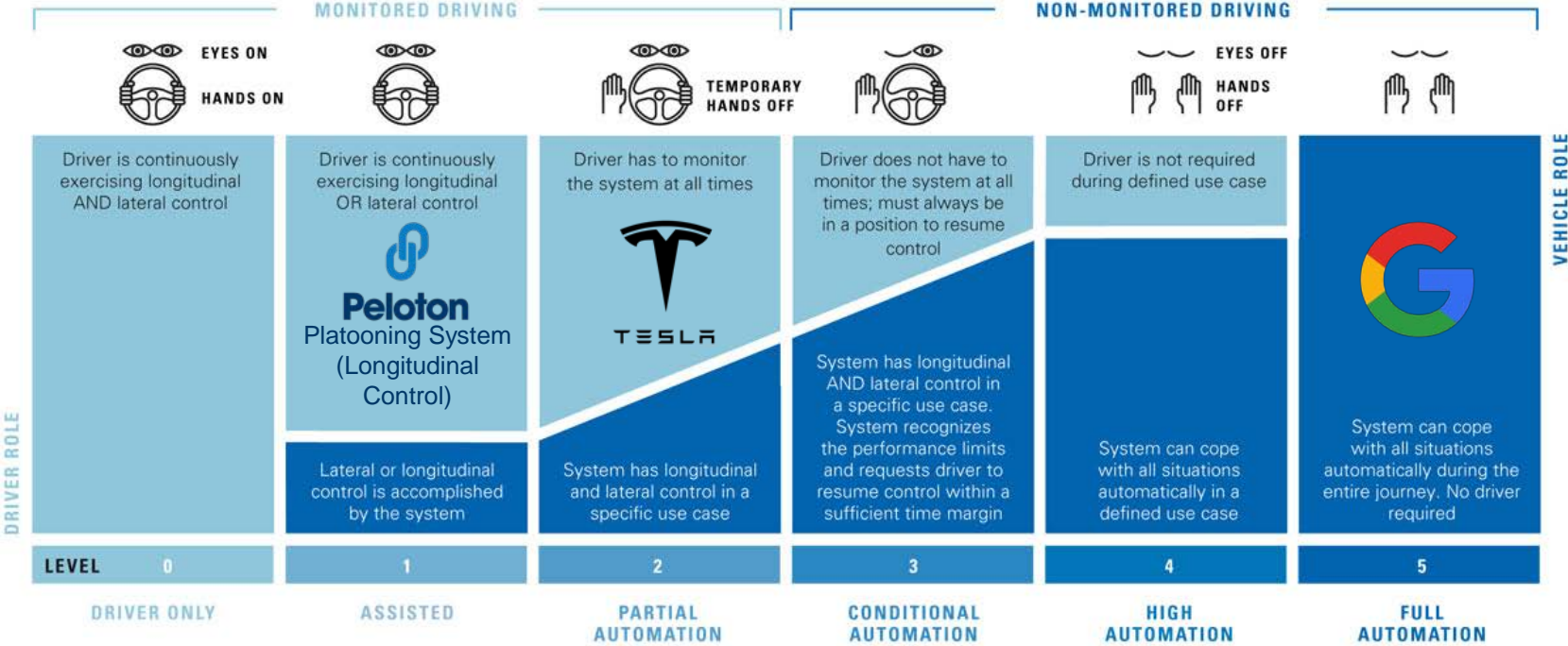
- Hands on
- Feet on**
- Eyes/Brain on



Rear Driver:

- Hands on
- Feet off**
- Eyes/Brain on

Peloton System: Driver Assistance, Not Automated Trucks



Graphic courtesy:



Team Driving: Enhanced Awareness & Driver Communication

Live video from other driver's view

- Look Ahead view of road ahead of lead truck for follow driver
- Both drivers in communication to share critical information

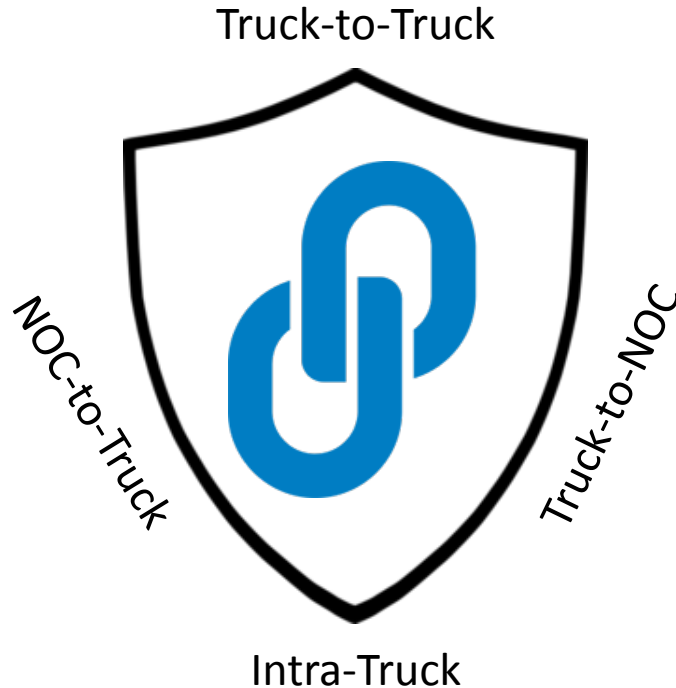


Peloton Technology: Best-in-Class Cybersecurity

Collaboration with Industry on Best Practices

Our Philosophy and Approach:

1. We use the **strongest available, independently audited systems**.
2. We **encrypt all communication** between trucks and with the Network Operations Center.
3. All communications are **mutually authenticated**.
4. We actively monitor for and **defend against malicious attacks**.
5. Our systems are continually improved through **automatic over-the-air updates**.



Peloton Technology: Improving Safety is our Highest Priority



- From NTSB: In 2012, over 1.7 million rear-end crashes
 - almost half of all 2-vehicle crashes
 - 1,705 fatalities and over half a million injuries
- Highway end-of-queue crashes involving commercial vehicles (often with fatigued or distracted drivers) are particularly deadly, such as the 2015 I-16 tragedy in Georgia.

Collision Avoidance Systems can prevent many crashes

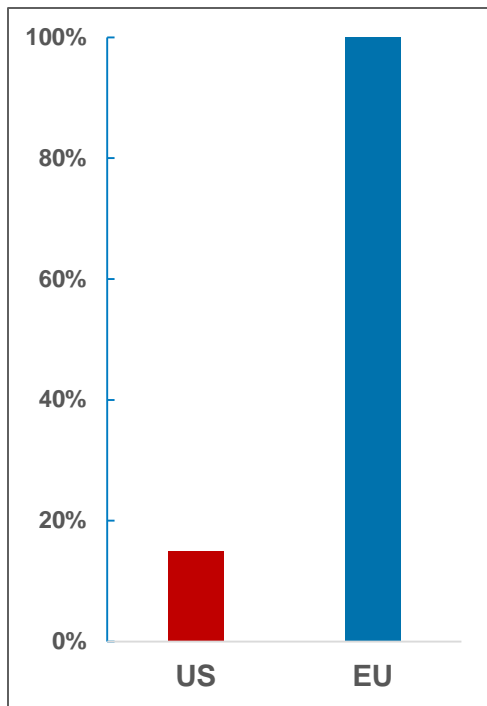
- Commercially available radar-based **Forward Collision Avoidance and Mitigation (FCAM)** Systems can reduce the frequency and severity of these commercial vehicle rear-end crash types.
- Con-way study:
 - 30 months w/ 12,600 tractors
 - **71% reduction in rear-end collisions; 63% reduction in unsafe following behavior**
- Volvo/USDOT study:
 - 3 years w/ 100 trucks
 - **80% of drivers preferred to drive w/ collision avoidance systems**
 - 37% reduction in “conflicts” (i.e. hard braking, situations that could result in collision)



MERITOR WABCO
OnGuard™
Collision Mitigation System

But Safety System uptake in US trucking has been slow

New Class-8 Trucks Sold w/ FCAM System



- EU regulations mandated FCAM systems on all heavy trucks since 2015, estimated to save 5,000 lives per year
- In US, Passenger car OEMs voluntarily pledge to make FCAM standard on all vehicles by 2022.
- No similar agreement on commercial vehicles in US, and years away from possible mandate.
- Systems can cost \$2-3k upfront and have hard-to-measure payback for fleets

Air Disc Brakes improve safety but currently in less use

ADB = improved braking, reduced fade, less servicing

...BUT, are on only about 13% of Class 8 Trucks

New lighter designs + other benefits = stronger ROI

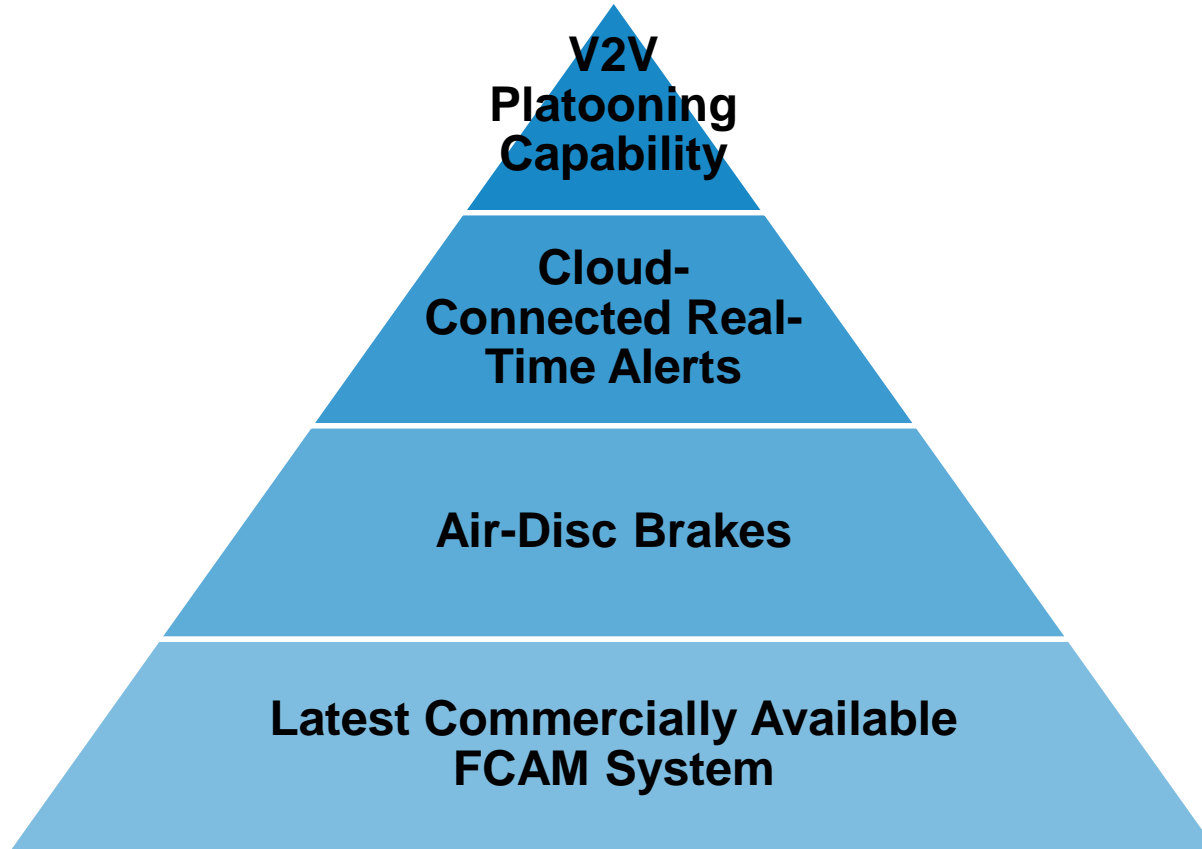
Summary of Air Disc Brake Benefits

Superior Performance	Shorter Stops	Stops 42 feet shorter than today's drum brakes** from 60 MPH Stops 100 feet shorter than today's drum brakes** from 70 MPH
	Better Braking Feel	Passenger car like feel Improved side to side brake consistency
	Safety	Greater braking power can result in fewer accidents
	Longer Lining Life	Typically twice the lining life of drum brake applications
Lower Maintenance	Sealed Design	Sealed design, no periodic lube required Sealed reliable, integrated automatic brake adjustment
	Quick Pad Changes	Quick change pads – 15 minutes per brake (with wheels off)
Light Weight	Design Optimization	Weight comparable to high performance larger (16.5") front drum brakes
		Patented splined rotor design with Aluminum Hubs for optimized weight Lightest dual piston air disc brake available

**Standard drum brakes compared to all wheel disc brakes on a 6x4 Tractor, 59,470 pounds GVW, un-braked trailer

Table Courtesy Bendix

Peloton-Equipped Trucks are Safer Trucks at All Times



Save Fuel:

Application of Foundational Equipment to Improve Fuel Efficiency

Prevent Crashes:

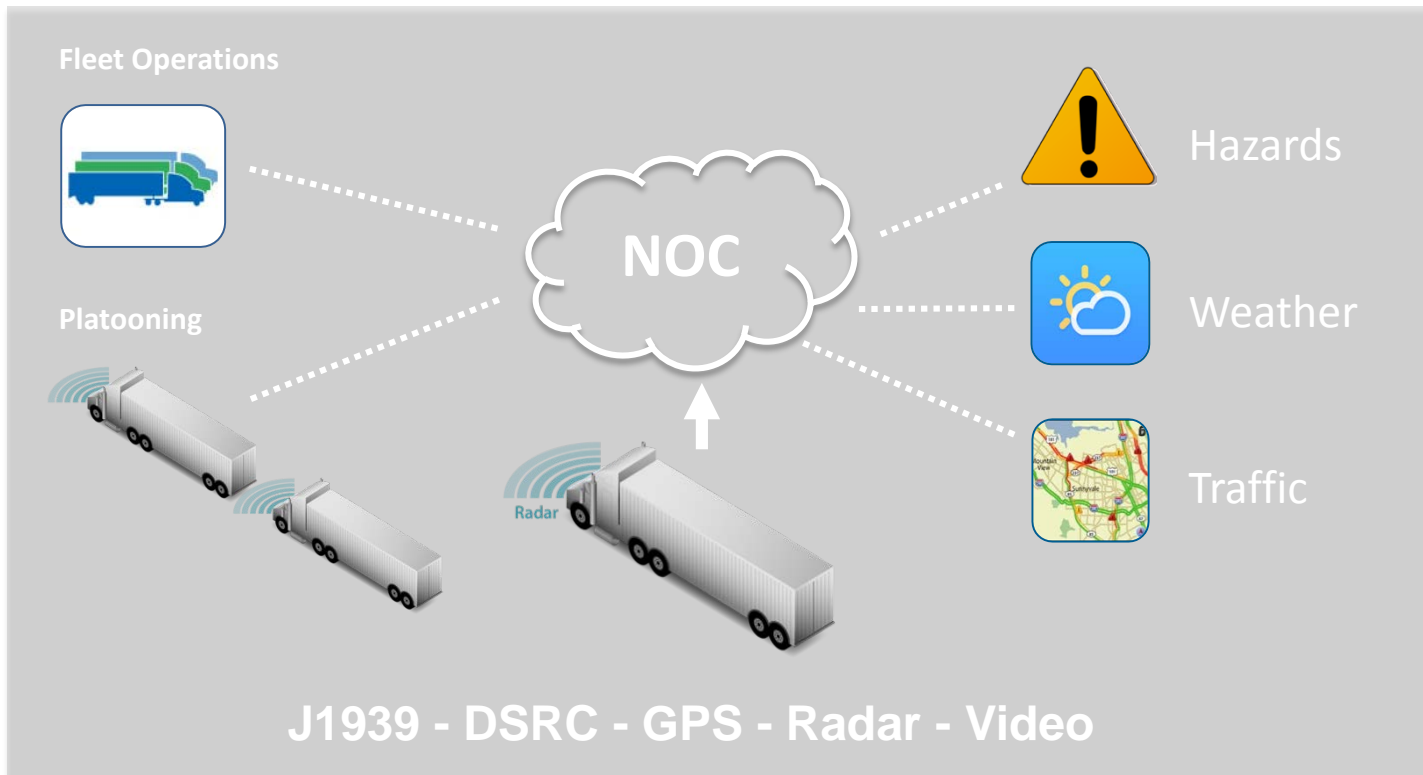
Foundational Equipment and Technology to Improve Driver & Truck Safety

Peloton's Driver-Assistive Truck Platooning System Requires + Incentivizes Adoption of Best Safety Specs & Systems

- Trucks must have the latest FCAM systems, LDW and air disc brakes, along with Peloton's proprietary DATP hardware, in order to platoon.
- In return for spec'ing trucks with FCAM, ADB, and the Peloton System, fleets are able to platoon and save fuel, creating a tangible economic benefit for adopting the latest safety equipment.



Peloton Network Operations Center: Over-The-Horizon Insights for Drivers. Safety Management.

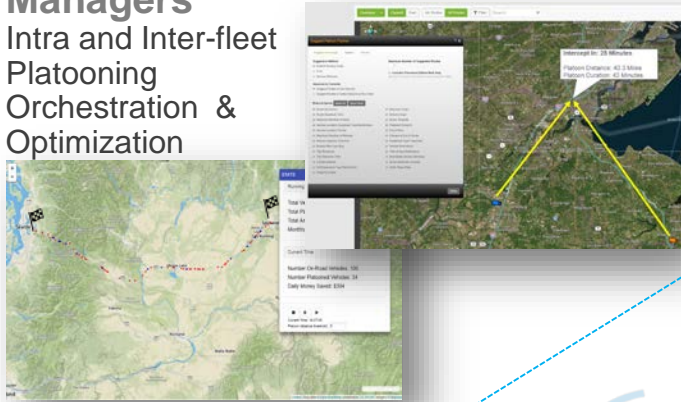


New Partnership: Peloton + Omnitrac's Enhanced Fleet Management & Platooning Orchestration

Omnitracs-Peloton Partnership Delivers Unique Synergies and Levels of Platooning

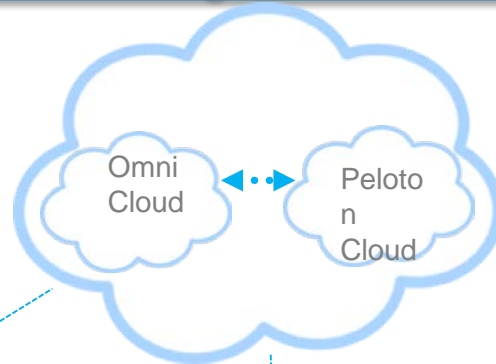
Fleet Managers

Intra and Inter-fleet
Platooning
Orchestration &
Optimization



Customer Back Office

Stop, payload,
vehicle, driver and
other dispatch
information



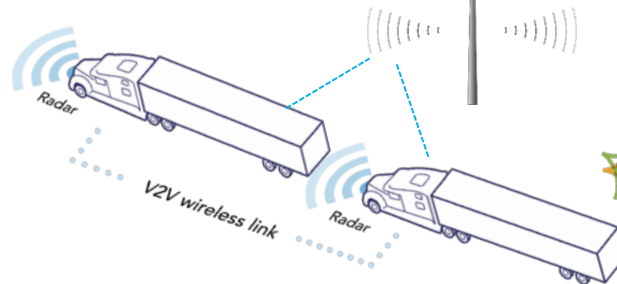
Drivers

Presented with and
navigated to platooning
opportunities



	Phil Friedman Departing in 5 minutes 83% Plan Match 10 Drive Hours Remaining
	Jean Taylor Departing in 5 minutes 25% Plan Match 8 Drive Hours Remaining
	Leroy Smith Departing in 30 minutes 95% Plan Match 3 Drive Hours Remaining

Platoon
opportunity just
past interchange



omnitracs



Peloton

Peloton

Peloton System: Independently Validated Fuel Efficiency



Fuel savings of 10% on rear truck and 4.5% on front truck

Verified savings at 40 foot gap at 64mph (NACFE)

Further independently testing by US DOE and US DOT

NREL & FHWA tests confirming savings at varying speeds, gaps of 75ft +

Driver Assistive Truck Platooning: Wider Benefits

- **Safety: Accelerating deployment of best active safety systems**
 - Crash reduction and crash congestion-related fuel savings
 - NTSB: Collision Avoidance Systems could reduce ~80% of rear-end crashes.
Example: Con-way (now XPO) reduced crashes 86% by fully deploying active safety systems (FCAM and LDW)
- **Health & GHG: Corresponding reductions in Diesel emissions**
- **Insight: Improved information for drivers and fleet management**
- **Mobility: Increased freight throughput and efficiency**
- **Economy: <1 year payback period for fleets, ongoing savings**

US Freight Arteries

Platooning focus: Multi-lane, divided, limited access highways



Market Opportunity: Many Types of Fleets Can Platoon

Many Trucks Travel in Groups Today...

LTL (Less than TruckLoad) Fleets:

Trucks travel hub-hub in groups by nature of operations



Private fleets:

Trucks travel in groups on high density corridors



Truck Load fleets:

Growing trend toward relay style operations w/ trucks in groups



...and can adopt platooning
with few changes to dispatching

Market Development: Government Engagement & Partnerships

Demonstrating platooning with fleets, establishing best practices & creating deployment pathway

Federal	States
<ul style="list-style-type: none">• Two USDOT (FHWA) platooning projects<ul style="list-style-type: none">• CalTrans/PATH/Volvo/Peloton• Auburn/Peterbilt/Peloton• DOE Volvo Supertruck 2• USDOT Smart City: SmartColumbus• USDOE ARPA-E (Purdue-Cummins+)• State projects include: TX Transportation Institute-TxDOT; CEC Port of San Diego	<ul style="list-style-type: none">• Commercial Approval Law: Michigan• Key Demo activity held in 7 states (MI, UT, NV, FL, CA, TX, OH)• Testing or Trials allowed in 9 states (AL, AZ, CA, CO, FL, NV, TX, VA, UT)• High Interest in 21+ states (AR, GA, IA, ID, IN, MO, MS, MT, NC, ND, NM, NY, OH, OK, OR, PA, SC, TN, WA, WI, WY)

Funded Projects with:



Thank You &
Discussion



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