

6 Trends That Will Define the Future of Truck & Trailer Connectivity



Overcoming a Challenging Environment

The current state of trailer connectivity can be summed up in one word: inefficient.

There are millions of active players in this space, each with their preferred OEMs, trailer technology, and connectivity systems.

Let's take a look at the numbers.

More specifically, there are:

- 4.6 million active trailers on the road.
- 3.5 million Class 8 trucks that haul those trailers.
- 1.2 million trucking companies (fleets).

These 1.2 million fleets own and operate that equipment. 97% of these companies operate fewer than 25 trailers.

This level of market fragmentation makes it difficult to affect global change across the market. It also makes it challenging for these providers to adopt new advancements in connectivity technology.

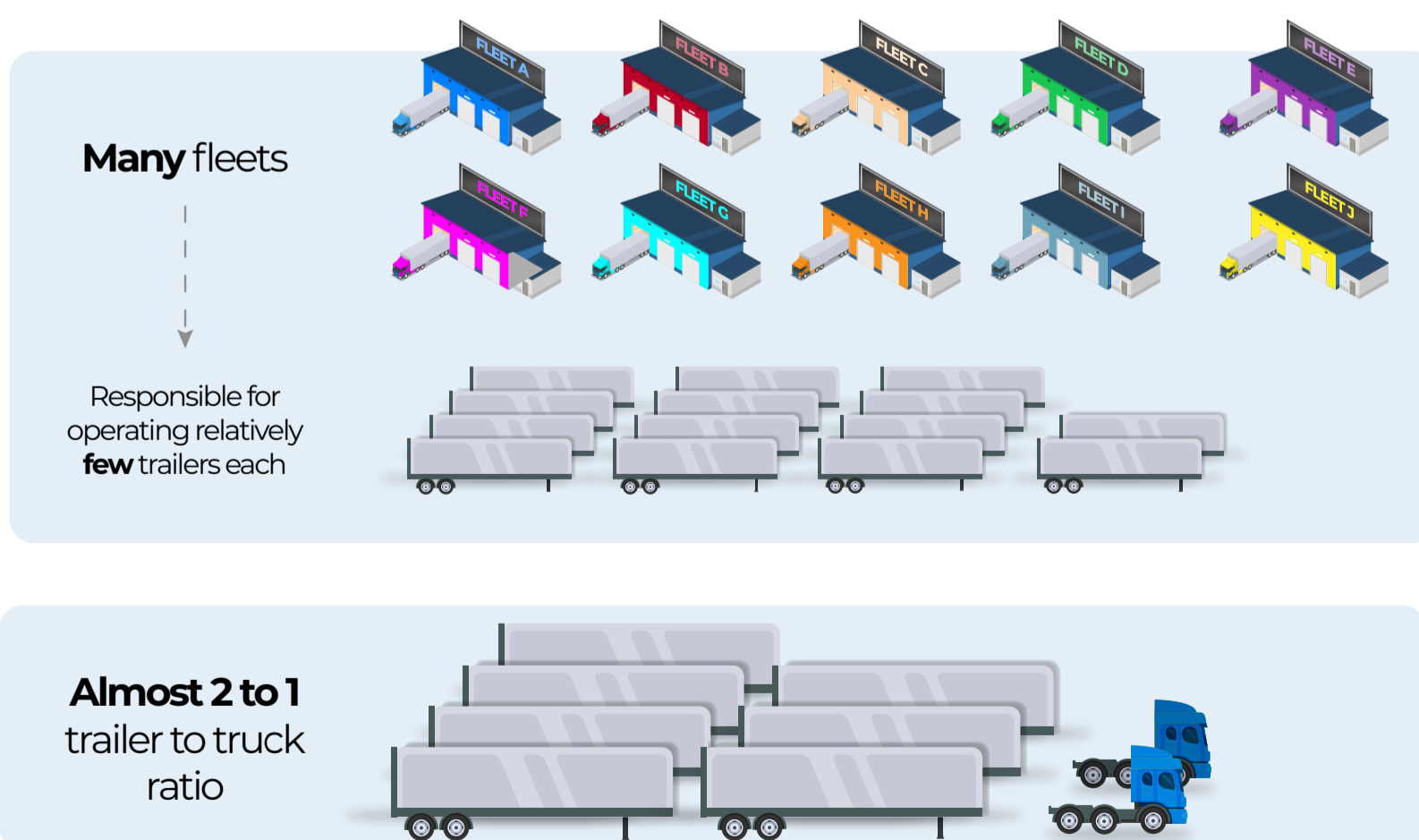
Compounding the issue of fragmented ownership groups is the fact that the average trailer spends about 75% of its time detached from trucks, which means it is unpowered and unconnected for most of its lifespan. Trailers also are nomadic by design – roaming the nation from job-to-job/fleet-to-fleet – making it difficult to update existing connectivity mechanisms systematically.

To put it bluntly, the current state of truck and trailer connectivity is a technology nightmare for fleets. Not only is it a highly fragmented space, but it is also burdened by technical debt incurred by outdated and non-standardized communication systems.

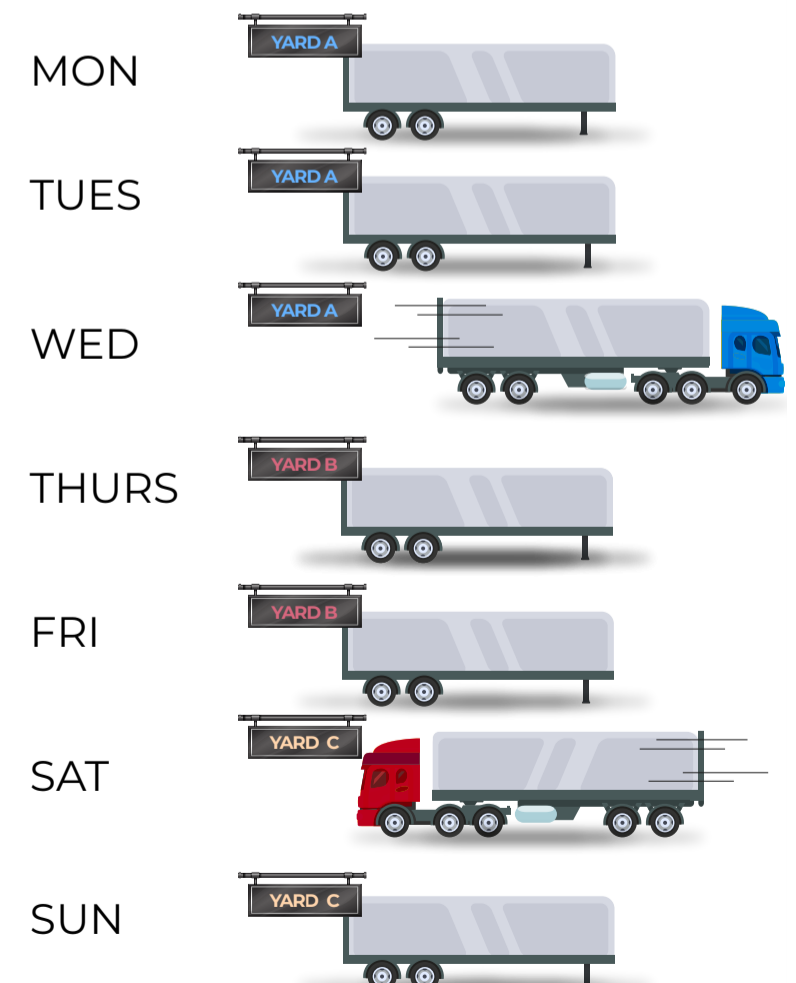


A fragmented ownership structure in the truck and trailer landscape discourages early adoption of new connectivity technology.

The (Complicated) Relationship Between Fleets, Trucks, & Trailers



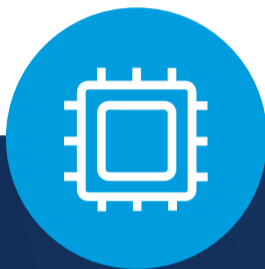
A Week in the Life of the Average Trailer



6 Trends Driving a Connected Future

The landscape is shifting. There is no space in the new world of autonomous trucks, electric vehicles, and always-on 5G connectivity for a technology that has remained relatively unchanged for more than seven decades. The connectivity landscape will need to evolve to meet the market's future demands. For fleet owners, this paradigm shift in technology represents an opportunity to expand their footprint and

secure their position in the changing market. Technologies like autonomous trucks are not a question of if, but when. We are not soothsayers. We do not pretend to have some sort of mystical connection to the future. What we do have, though, is decades of experience in this industry. **Here are the six key trends we see impacting the future of truck and trailer connectivity.**



An increased use of Electronic Control Units (ECUs) in trailers.



Advancements in Edge computing will improve performance of the vehicle.



Autonomous vehicles will command how connectors are designed.



Changes in the physical shape of trucks and trailers will determine the needs of new units.

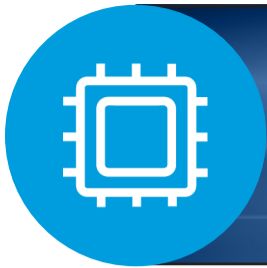


Deeper collaboration between OEMs.



Improvements in manufacturing and implementation will help scale these new technologies and bring them to market en masse.





Trend #1 A Greater Use of ECUs in Trailers

There is broad recognition across the industry, from both fleets and the largest trailer OEMs, that advanced electronic features improve trailer safety and productivity.

A growing number of forward-looking fleets purchase their trailers with a high-compute, central domain controller that is fully integrated with a wired CAN network which connects independent ECUs together on their trailer assets (into the walls, floor, and ceiling of trailers).

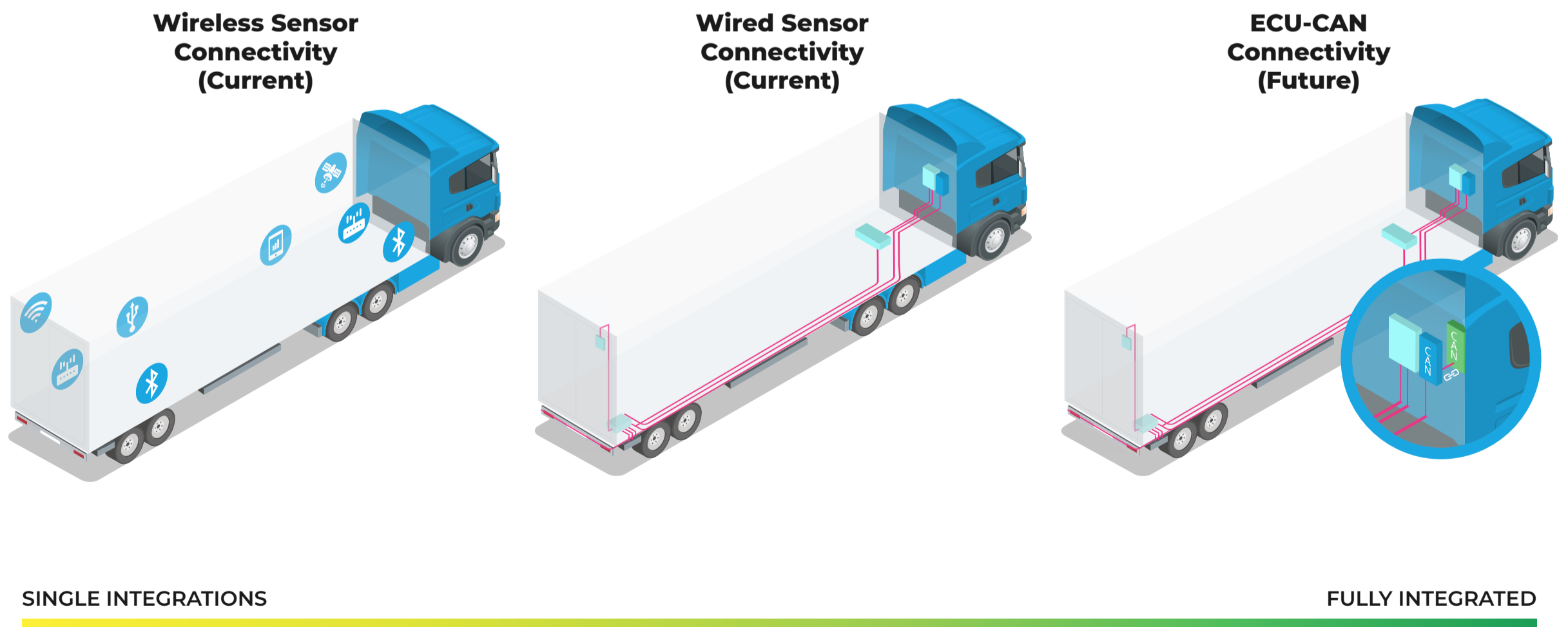
Many of the largest fleets are becoming more intimately involved in the design phases of new ECUs on trailers. In the interim, fleets are instructing trailer OEMs to spec all their new builds with an integrated CAN architecture that equips their trailer assets with the capability to add new ECUs in the aftermarket.

Trailers built today will still be on the road in 2035. The technology wave will continue, and trailers need to be built in a way that facilitates upgrades. This approach provides fleets with a future comparative operational advantage against their peers and sets them up for higher resale values at the time of trade.

One potential bottleneck to the adoption of an ECU-rich individual connectivity system is the bandwidth limitations of the current connectivity unit. The current wireless system does not have the capabilities to meet the data-streaming needs of the new wave of CAN and ECU integration.

Unfortunately, even though it is a critical need to be solved, there is a reluctance to completely redesign the connector given that there are millions of trucks and trailers currently in operation. For these stakeholders, taking these trucks and trailers off the road is not an option. Any advancements in this space need to account for backward compatibility.

The good news though, is that tech-native companies, known to be the best at disrupting industries that are slow to change, are engaging directly in discussions with OEMs to design and produce connectivity technologies that align with the practical needs of the market.





Trend #2 Shipping on the Edge

The entire transportation industry is in the midst of a revolution. We are living through an era of extraordinary increases in processing power on the “edge” and the miniaturization of electronics.

Edge computing is computing that is done at or near the source of the data, versus computing in the cloud. Edge computing is well suited for applications that depend on quick and reliable response times without reliance on a network connection.

Edge computing is a game-changer for the connectivity industry.

The current physical connection between the truck and trailer (aka SAE J560) was developed in 1951. It was designed to provide a standardized cable plug and receptacle (similar to what USB did for the computer industry) so that all truck OEMs and trailer OEMs could ensure the proper transfer of brake and lighting information from the driver to the specific

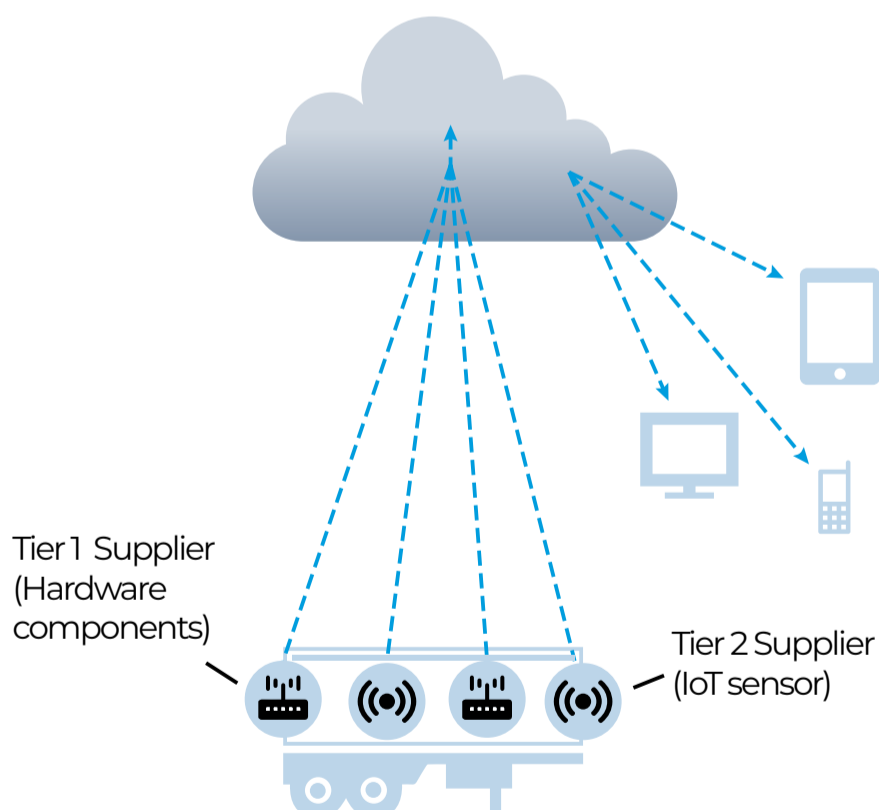
system. This system is 100% dependent on driver input to operate.

With edge computing, we could remove the driver’s need to provide the input for these safety features as the computer itself (located within the connectivity unit) will have the capability to process data in real-time and drive its own safety decisions.

Edge computing also provides a more secure and private operating environment when compared to cloud-based technologies. Instead of beaming data to and from a centralized server via a mobile network to be processed, all computing will be done on the site, limiting the risk of targeted cyberattacks.

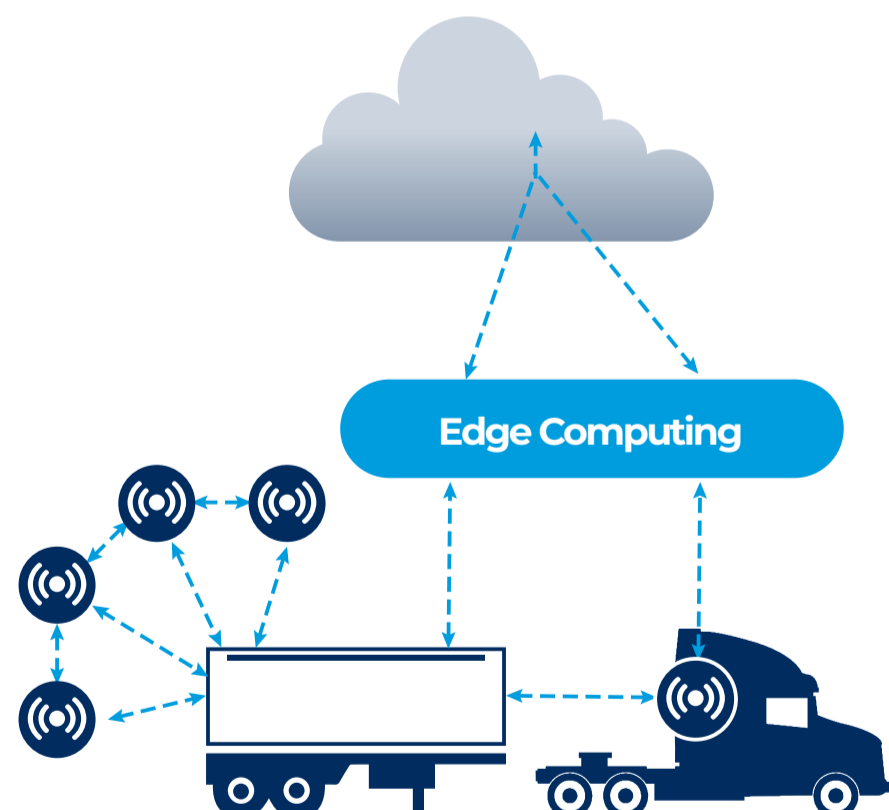
As we move closer to a world of autonomous vehicles, edge computing technologies will continue to evolve as these systems are a perfect use case for improving the safety of autonomous vehicles.

Cloud Computing



Low security, numerous single connections, redundant costs

Edge Computing



High security, fully integrated architecture, cost effective



Trend #3

Autonomous Trucks Will Command the Market

The trend towards autonomous trucks is not hard to spot; it is talked and written about ad nauseam. And while autonomous trucks will not be ubiquitous next year, there will most certainly be an active, and growing, population on America's highways.

Trailers have a vital role to play in the path to autonomy, particularly when it comes to safety. After all, the expectation is that these autonomous trucks will continue to move freight and support our collective shipping and transport needs. The trailer and the truck will need to be in continuous sync with each other to operate at peak efficiency and safety.

Automation technologies rely on real-time, condition-based health and status information. The autonomous truck will need to pull data from the trailer to know the health status of critical safety components, including but not limited to:

- ABS
- Electrical
- Wheel End Temperature
- Brake Stroke
- Doors Latches
- Trailer Tire Inflation
- Loaded Weight
- Load Status

As well as dozens of other data points.

Today, when a driver sees smoke coming from the tires or feels something off with the trailer, the driver takes over and pulls the vehicle off the road. Once you take the driver out of the cab, there will need to be a new source of data from the trailer that feeds the "brain" of the autonomous technology.

A temperature gauge will need to register the fire, then send the information through the system. The truck will then need to either release fire control agents while driving or (more likely) make the decision and begin the protocol for moving over to the side of the road - all without direct human interaction.

These data sets and correlating instructions will need to pass through a new connectivity system that can deliver two-way communication at near-instantaneous speeds.



65 percent of the nation's consumable goods are trucked to market. With full autonomy, operating costs would decline by about 45 percent, saving the US for-hire trucking industry between \$85 billion and \$125 billion.

2018 McKinsey & Company Report – Travel, Logistics and Infrastructure



Trend #4

A New Physical Shape for Trucks and Trailers

This current system, the combination of truck + trailer, has always been designed and optimized around the driver rather than around the movement of freight. And, while this system will hold a special place in our hearts, we believe that as technology matures (particularly for long-haul highway moves), companies will begin to rethink the design of the physical system they use to move freight.

Most noticeably, the removal of the cab.

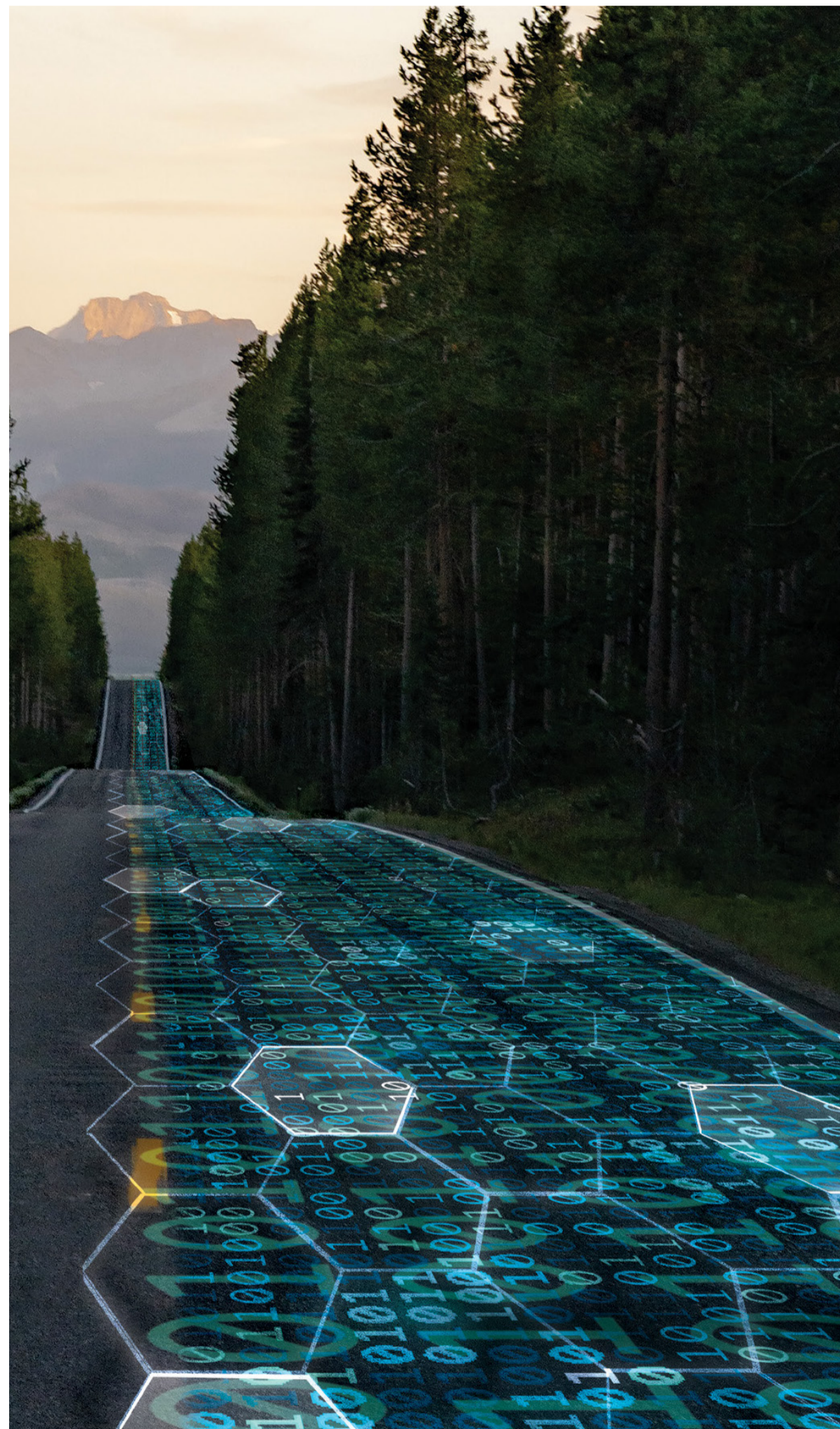
With the cab removed, there is an opportunity to extend the trailer's length beyond today's 53' limit. This is coveted space, particularly when you consider the ever-increasing shipping needs of new ecommerce and direct-to-consumer companies.

A host of benefits comes with removing the cab, including:

- A significantly improved aerodynamic profile (eliminating the large pocket of air that exists between today's combination truck and trailer)
- Less energy consumption (thanks to this more aerodynamic profile)
- A reduction in traffic congestion and yard space
- A lighter weight and less expensive transporting system (removing the set of steel, aluminum, composite, and electrical harnessing that houses the guts of the truck)

It is important to emphasize that validation of the autonomous tech stack and regulatory approvals are the bottleneck, rather than development of the hardware (cameras, LIDAR, radar, compute). Following regulatory and societal acceptance of autonomous trucks, there will be a swift transition to developing alternative form factors that tackle the inefficiencies of combination vehicles.

For example, a complete reinvention of the trailer is within the realm of possibility over the next decade (Zoox and Einride have innovative takes on this). An emissions-free, fully autonomous trailer designed around maximizing the efficient movement of freight is the end game for the long-haul space – think of middle mile movements, mainly on highways, between distribution centers.





Trend #5 More Collaboration Between OEMs

Trailer technology is advancing rapidly. In fact, in many cases, there is direct collaboration between the truck OEMs and the trailer OEMs that will set the stage for future standards. However, the days of OEMs comprehensively defining specifications and suppliers delivering on them have ended.

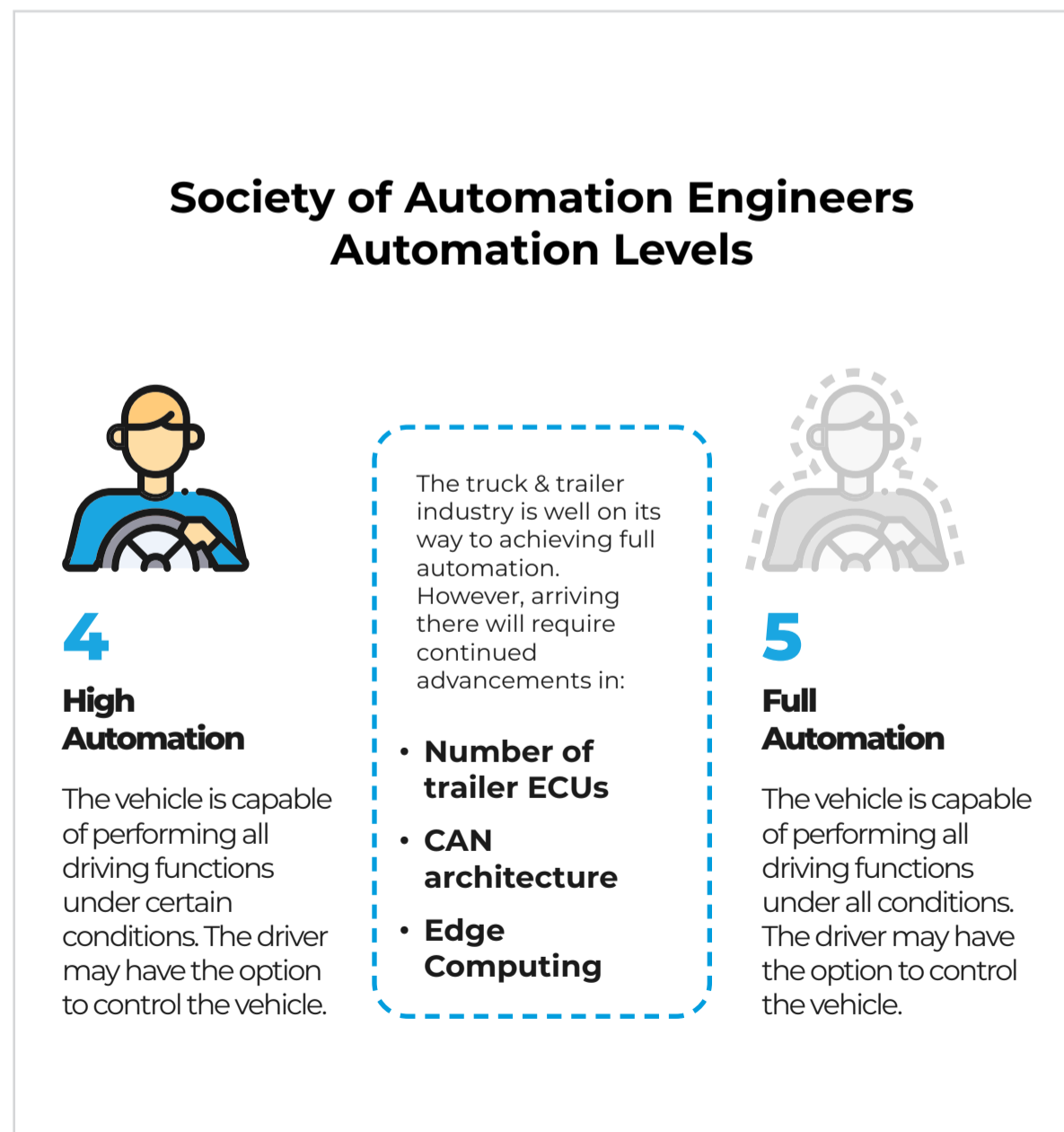
Neither OEMs nor traditional Tier 1 suppliers can fully define the technical requirements of new autonomous and electric systems.

Co-development between truck OEMs, trailer OEMs, and autonomous tech-native companies is a prerequisite. Some, not all, of these discussions have been publicly disclosed over the last few months. OEMs provide domain-specific vehicle safety and durability testing, validation, and ultimately assembly and production of a tech-integrated vehicle.

Level 4 and 5 autonomous trucks (SAE Automation Levels) require hardware and harnessing to be designed into the truck at the time of build. The existing population of trucks

(~3.5 million units) will not be retrofit candidates for several reasons, but most critically, autonomous vehicles require redundant steering systems, redundant braking systems, and redundant powertrain control systems.

Trailers will follow a similar path with purpose-built architectures that communicate necessary data, on the edge, to the main autonomous processing computer.





Trend #6 Scalable Manufacturing and Installation

Manufacturing and installation are critical bottlenecks in the adoption of any new system. However, what we've seen in other industries holds true in our space as well. As the technology improves, so will the ability to scale the manufacturing and adoption of the critical components of this system.

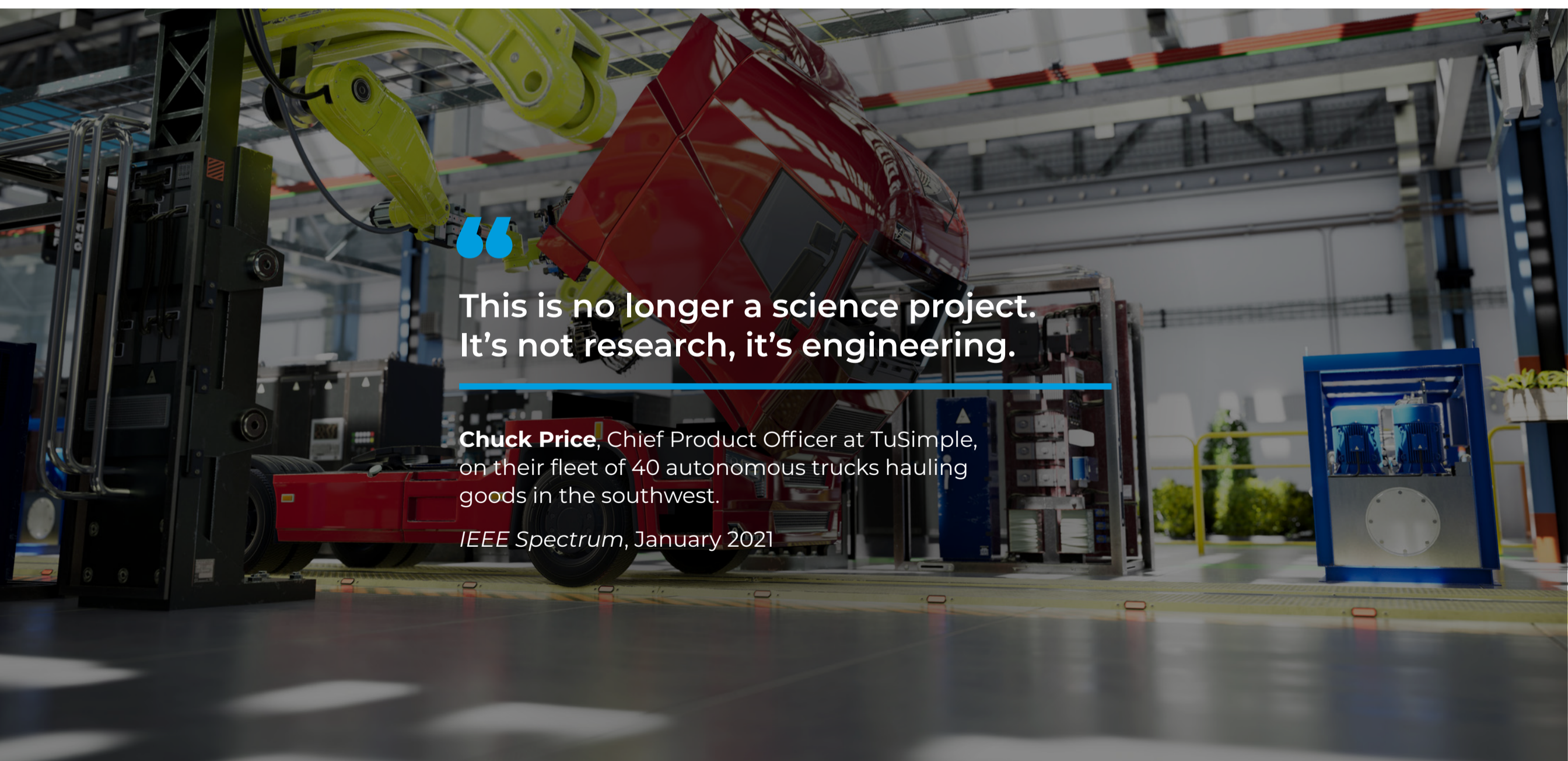
It doesn't matter if you're making trucks, buses, boats, or pizzas. Building 10 of anything is one thing, building 50,000 custom pieces is another. Scaling beyond a certain threshold requires a unique set of capabilities, including but not limited to:

- Supply Chain
- Manufacturing Labor
- Capital/Equipment
- Mechanical Engineering
- Quality Control
- Aftermarket Network

We anticipate that an ever-increasing interest from Wall Street and private investors in the FreightTech space will help fuel this improvement in manufacturing output.

According to Morningstar, the average round size for a Series B round in the FreightTech industry increased 78% from \$24.5 million in 2014 to \$43.6 million in 2017.

As technology advances, the FreightTech industry will continue to be infused with talent and capital. These investments will not only go into improving the technology that will power the future state of the industry, but also in creating the systems and processes that will deliver the technology to our highways.



“
This is no longer a science project.
It's not research, it's engineering.”

Chuck Price, Chief Product Officer at TuSimple,
on their fleet of 40 autonomous trucks hauling
goods in the southwest.

IEEE Spectrum, January 2021

Future technological advancements represent significant opportunity

The trailer of the future will be a fully integrated system that does a portion of computations on the edge, sends certain relevant data to the cloud, and when tethered to a truck, streams critical safety data from the trailer to the truck in real-time (video, LIDAR, component health, etc.).

All of this culminates with the simple fact that a higher performing connectivity system equates to a stronger performing profit margin for all stakeholders.

Lean into these emerging trends. Make the investments necessary and capitalize on the opportunity that exists now, and in the future, to increase the profitability of your business.



Safety improvements decrease the risk of accidents or other mistakes that can have significant costs.



Wear-and-tear-monitoring can enable fleets to proactively maintain their vehicles and take care of minor inconveniences before they become major problems.



Autonomous vehicles will allow fleets to increase the number of hours a trailer can be active—robots don't need bathroom breaks.

About FleetPulse

FleetPulse by Great Dane is the smart trailer telematics system designed and developed by trailer experts. Connect your fleet in powerful ways and drive your business forward. To learn more about FleetPulse by Great Dane, and how we're preparing for the future of truck and trailer connectivity, visit: www.fleet-pulse.com.

