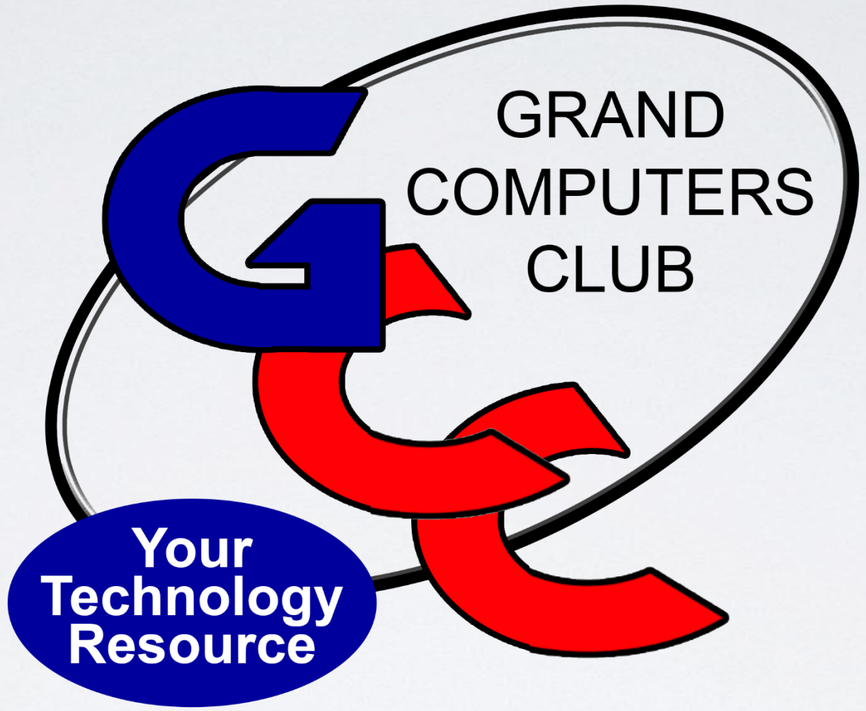

GRAND
COMPUTERS
CLUB
Your
Technology
Resource

NEW TECHNOLOGIES SIG
TOM SHEPHERD

NEW TECH SIG UPDATE

Topic for March Meeting

HIGHLIGHTS FROM THE 2021 CONSUMER ELECTRONICS SHOW - GADGETS AND GLIMPSES INTO THE FUTURE

THURSDAY MARCH 18 - 3:30PM

NEW TECH SIG

WE NEED IDEAS

ALL YOU HAVE TO DO IS SEND ME AN EMAIL ABOUT SOMETHING YOU WOULD LIKE TO LEARN MORE ABOUT AT

NEWTECH@GRANDCOMPUTERS.ORG

NEW TECHNOLOGIES SIG

MEETING EVERY MONTH
3RD THURSDAY 3:30

A forum for the open discussion of technologically advanced ideas and experiences

Contact Tom Shepherd for additional information at

NEWTECH@GRANDCOMPUTERS.ORG

Today’s Topic

TOP TECHNOLOGY TRENDS THAT WILL TRANSFORM THE AUTOMOTIVE INDUSTRY IN 2021

AGENDA

Automotive Electronics

Electric Vehicles

Advanced Driver Assistance Systems (ADAS)

Self Driving Vehicles

Q&A

Computers within vehicles is not new

There are two technologies that have been in place for years

- The Engine Control Unit (ECU)
- The Controller Area Network (CAN)

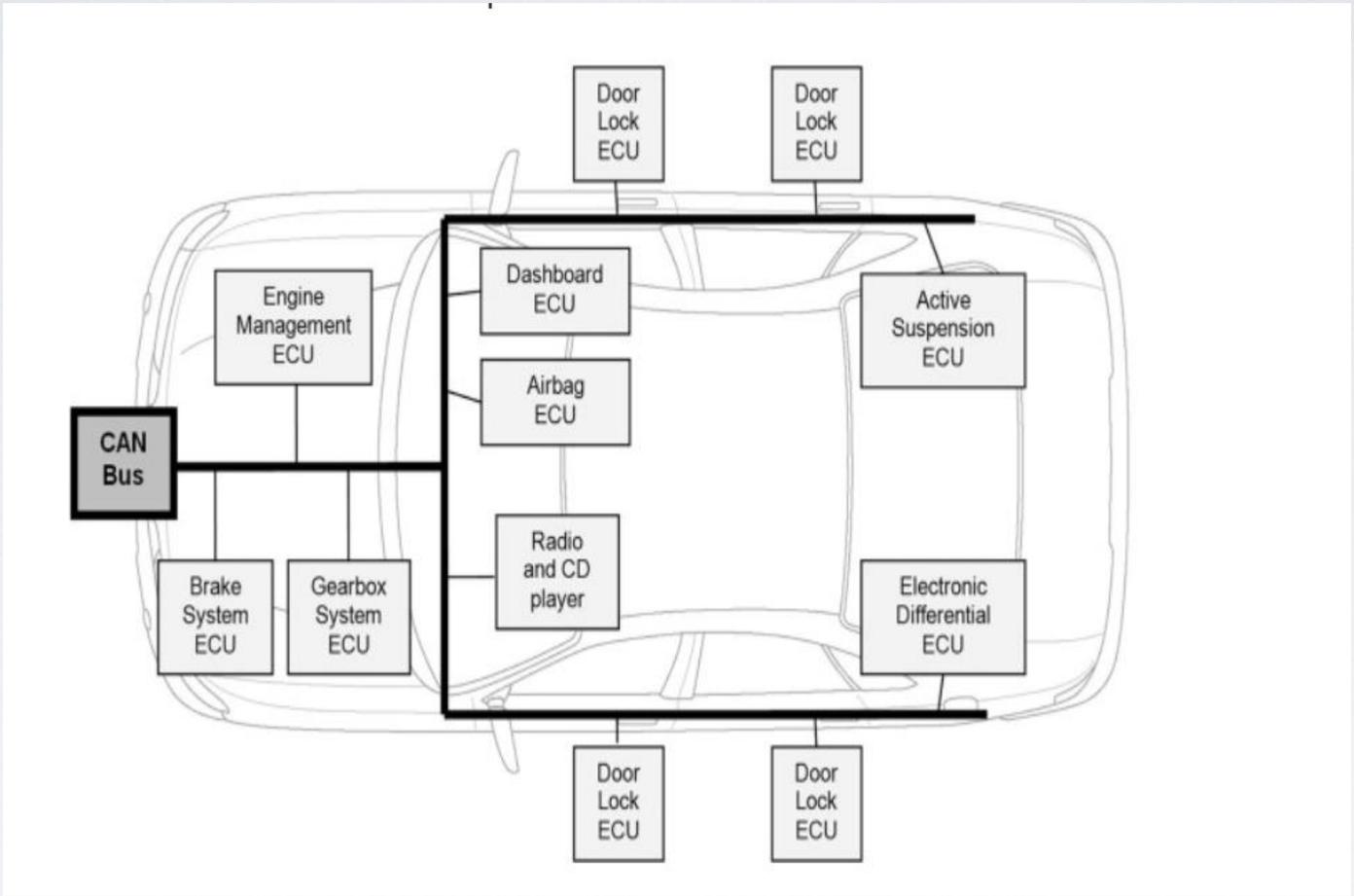
These two combined served to monitor emissions, control fuel injection, etc.

Here’s a definition of the ECU

An **engine control unit** (**ECU**), also commonly called an **engine control module** (**ECM**) is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance. It does this by reading values from a multitude of sensors within the engine bay, interpreting the data using multidimensional performance maps (called lookup tables), and adjusting the engine actuators. Before ECUs, air–fuel mixture, ignition timing, and idle speed were mechanically set and dynamically controlled by mechanical and pneumatic means

And here is the CAN

A **Controller Area Network** (**CAN bus**) is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer. It is a message-based protocol, designed originally for multiplex electrical wiring within automobiles to save on copper, but it can also be used in many other contexts.



This is the way it used to be

In today’s world, we need our vehicles to have many more sensing and AI capabilities

In today’s world, we need our vehicles to have many more sensing and AI capabilities

Camera and radar systems are widely used as the conventional active safety sensors for advanced driver-assistance systems (ADASs), however these sensors have limitations.

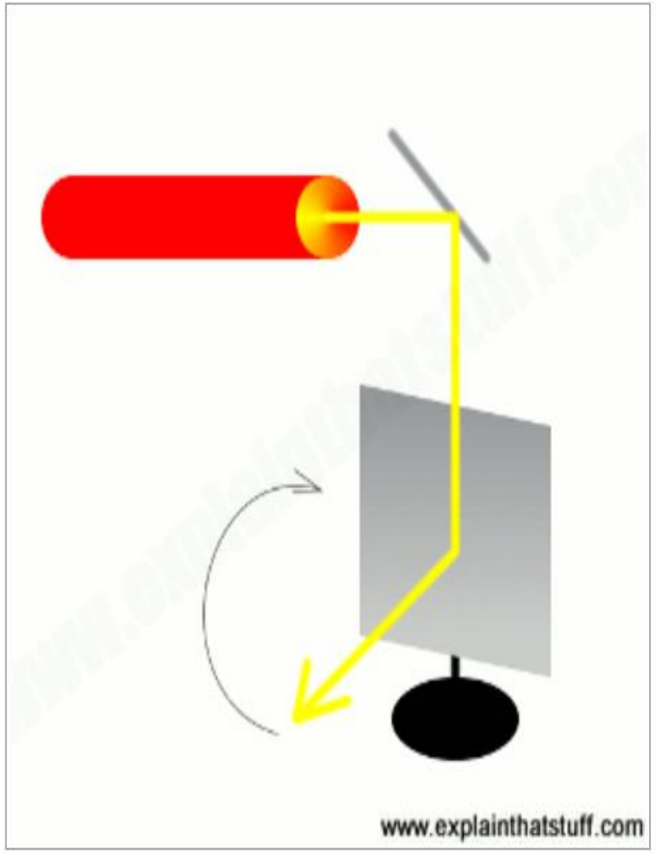
For example, cameras don’t work well under bad ambient light conditions, and radar has limitations in detecting stationary obstacles.

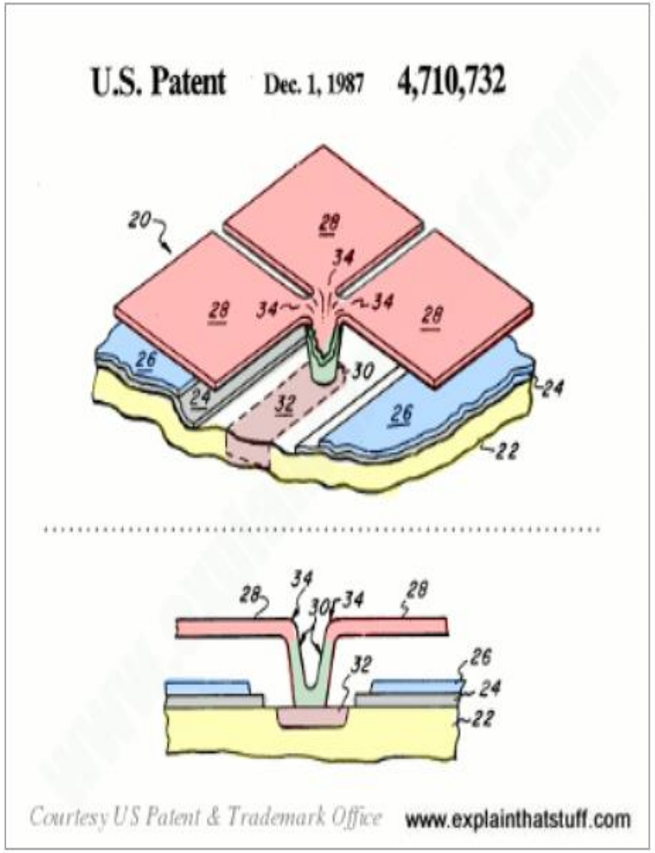
To achieve a full safety perception for autonomous driving, additional sensor types—ranging from underground mapping, thermal imaging, and LiDAR (light detection and ranging), combined with better camera and radar—are going to play a role in ensuring the highest safety standards possible.

What is LIDAR?

Take a look at a factory-floor robot or a self-driving car. What's that weird, whirling can thing sitting on top like a helmet?

That's the LIDAR: it's spinning round, firing invisible laser beams in all directions, catching the reflections, and measuring how long the beams take to return so it can figure out what obstacles are nearby and how far away they are





Animation: 1) In theory, LIDAR lasers are scanned by firing them off a fixed mirror (top) and a rapidly rotating one (bottom).

Artwork: 2) In practice, it's not quite so clunky, and modern LIDARs tend to use very small microscopic mirrors based on MEMS technology. Each tiny mirror segment (pink) tilts on a hinge (green), attracted by the electrically charged plates below (blue). Artwork from US Patent 4,710,732: Spatial light modulator and method by Larry Hornbeck, Texas Instruments, 1987, courtesy of US Patent and Trademark Office.

The LIDAR itself doesn't spin – the mirrors do

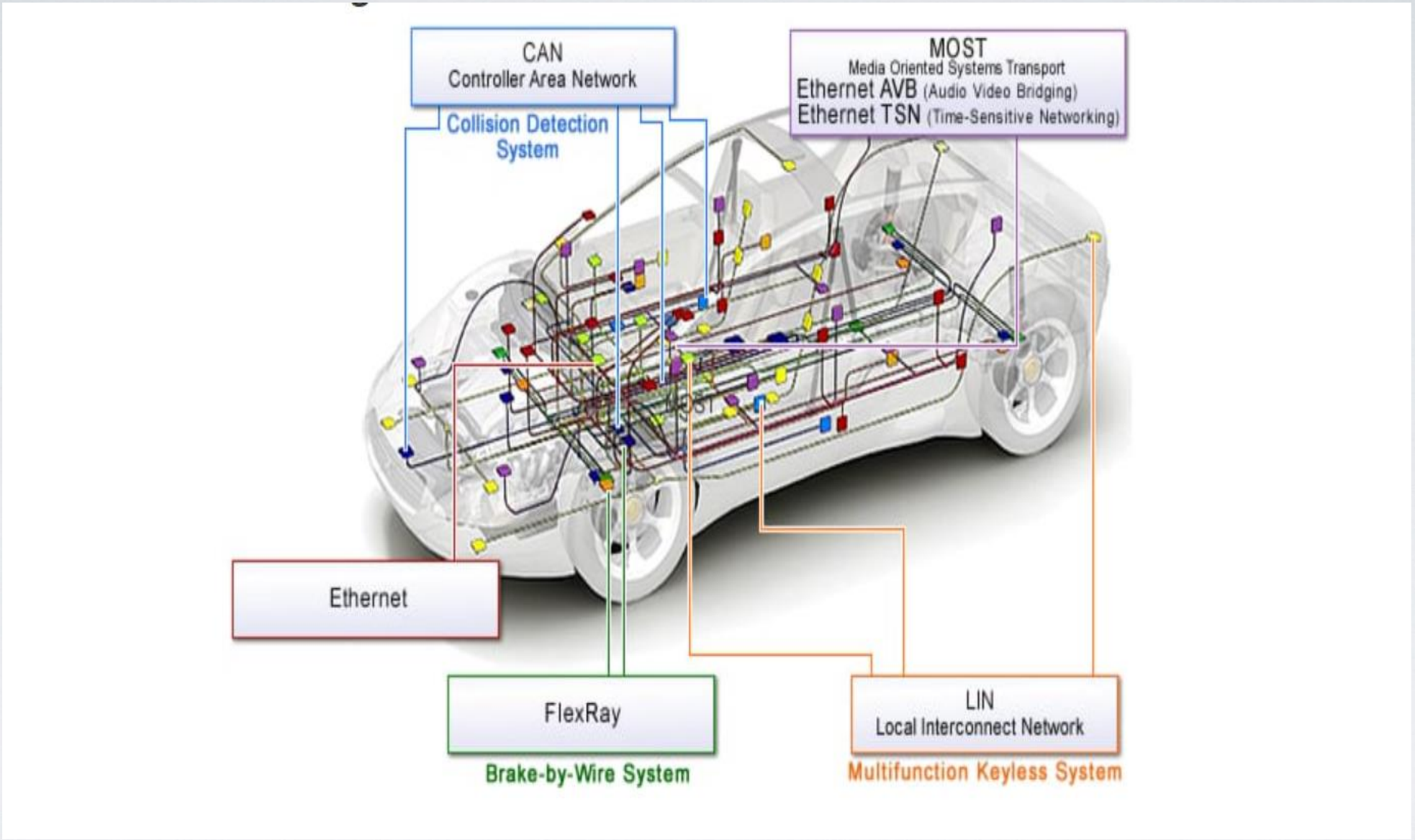
The challenge is to deploy all these sensors

connect them together,

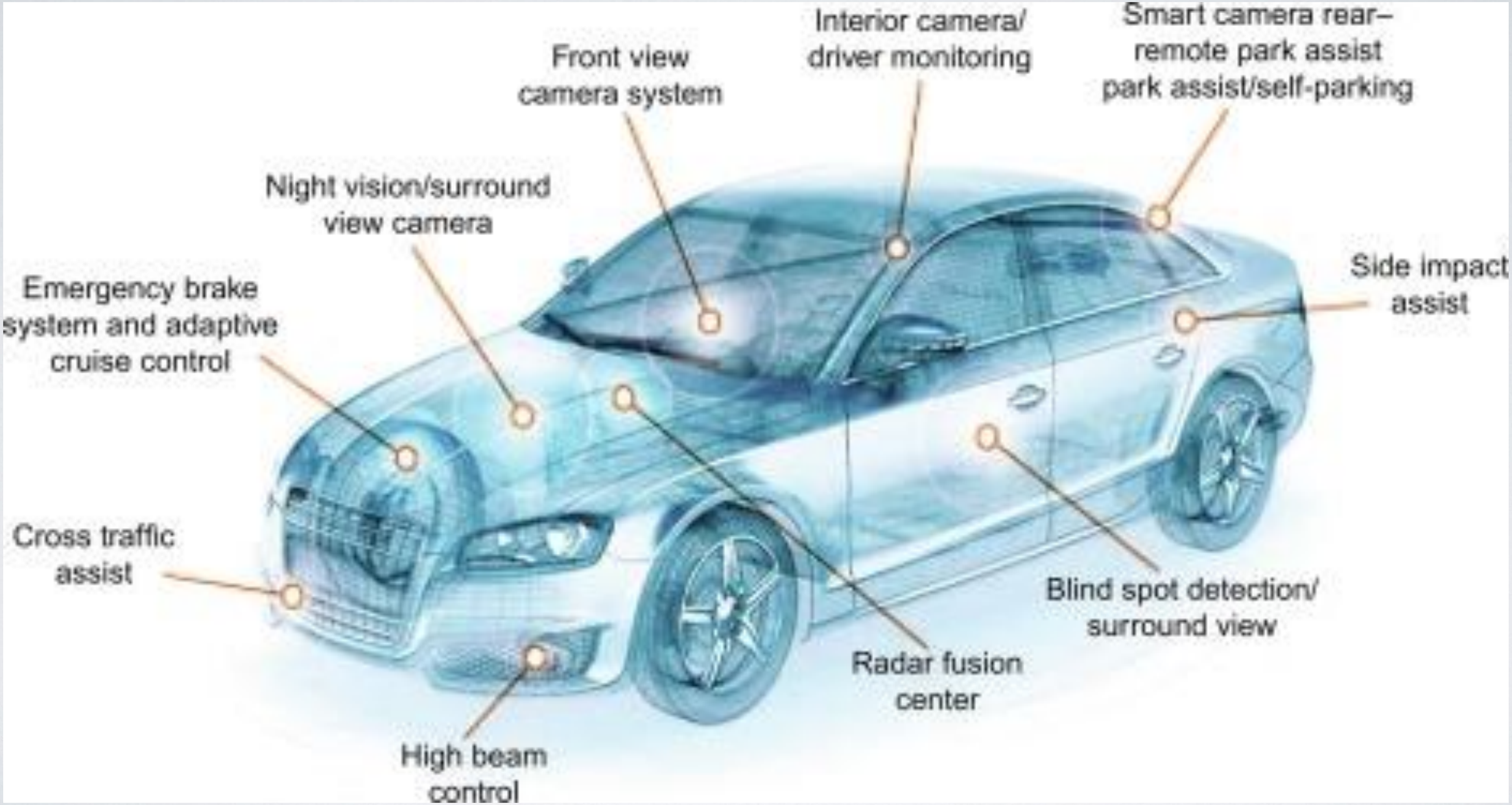
send their input to various ECUs,

have the software in the ECUs to make decisions,

and either alert the driver or take control of the vehicle

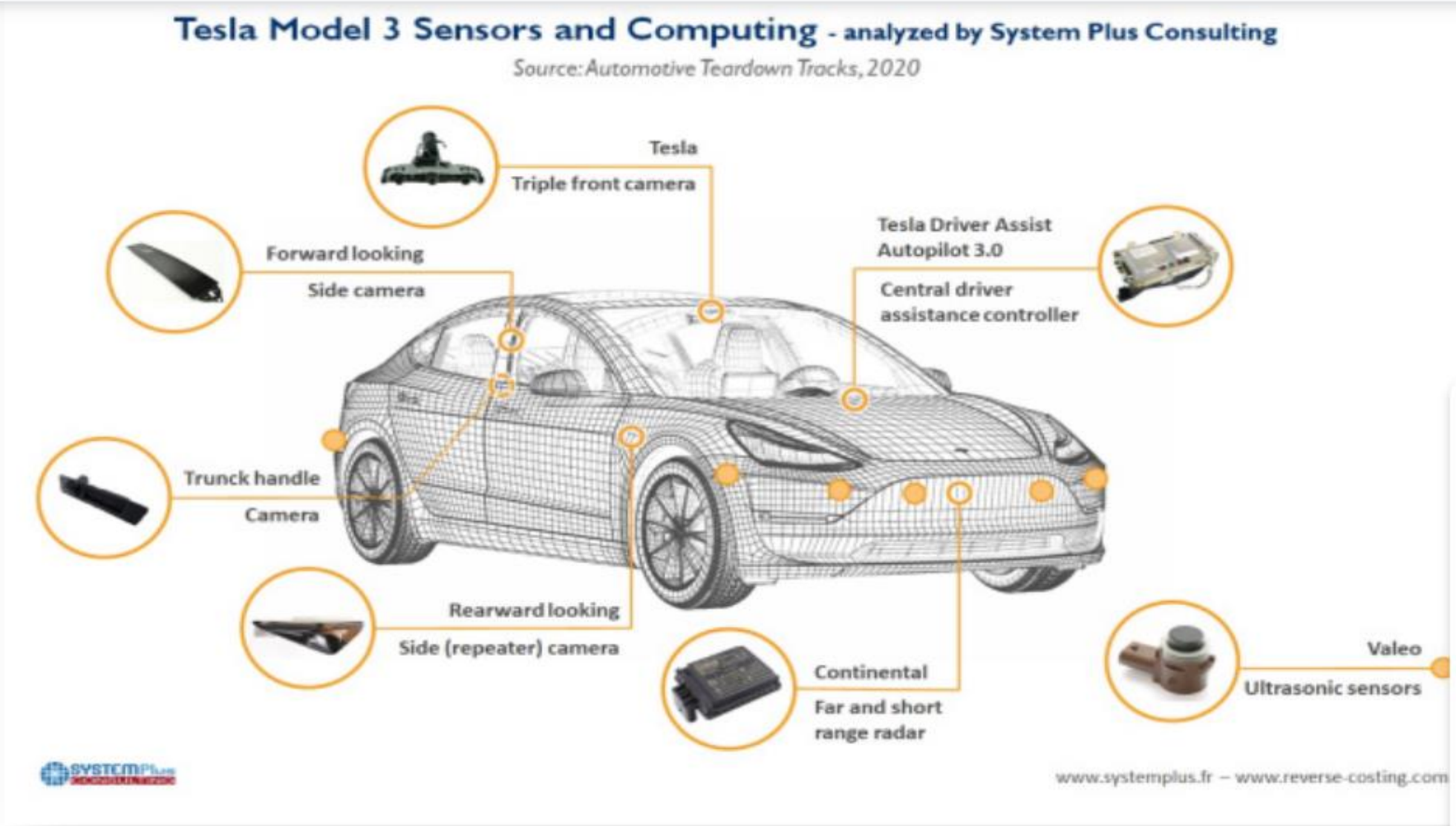


Here are some of the networks in today's vehicles



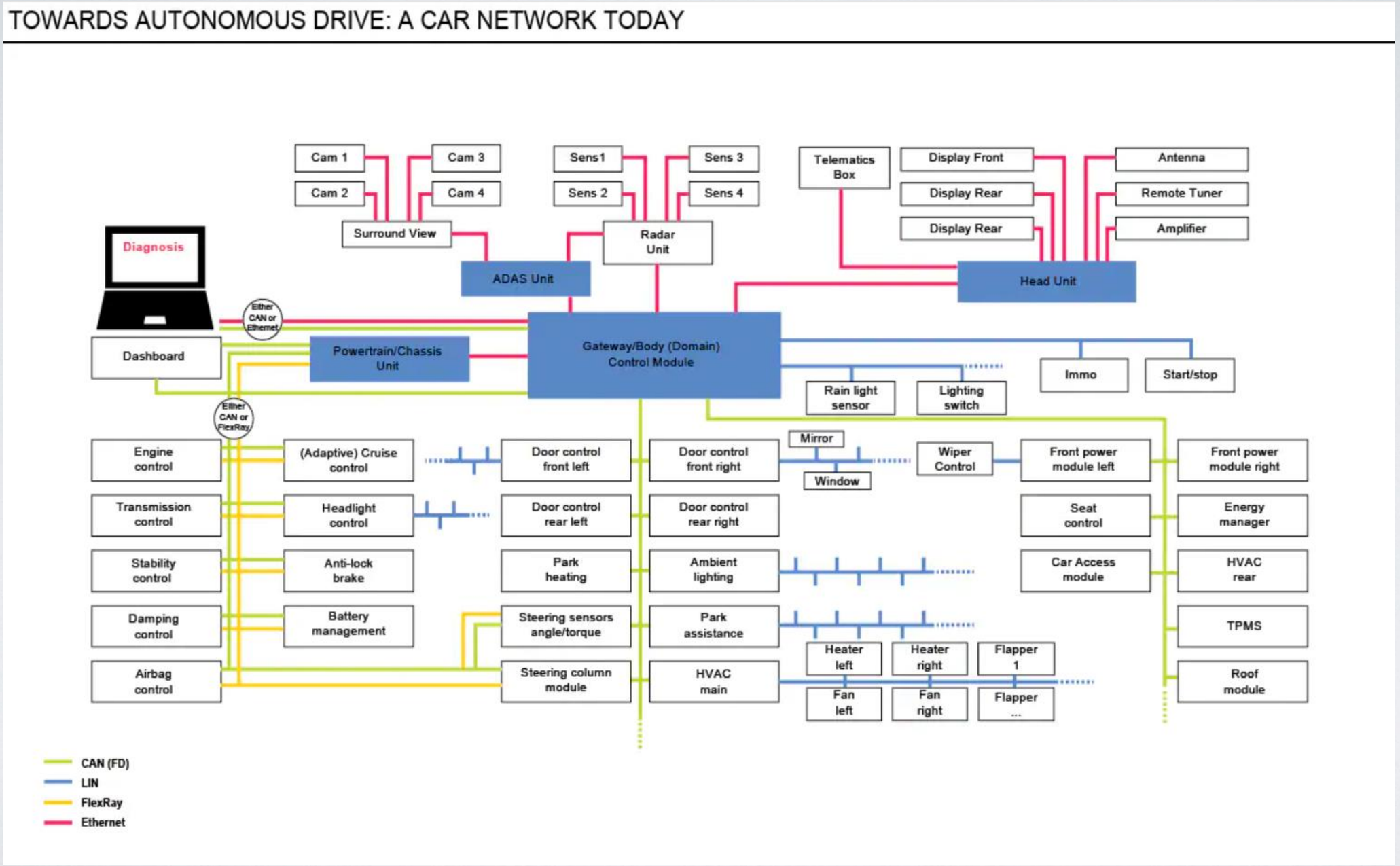
Here are some of the sensors

And here is a vehicle from Waymo with LIDAR mounted on the top



(Source: System Plus Consulting)

Elon Musk does not like LIDAR – he likes cameras and radar



This is the future

Dec 6, 2019 - Energy & Environment

Modern cars are testing the limits of their computer hardware

Joann Muller, author of Navigate

Illustration: Sarah Grillo/Axios

With more than 100 million lines of code in the modern car, advanced software features are testing the limits of the computer hardware under the hood. And it will only get worse: Electric, connected and automated cars will devour even more computing power in the future.

Why it matters: Automakers face an urgent need to redesign their vehicles' electronic architecture — essentially their brain and central nervous system — to handle the onslaught of advanced features that will one day allow cars to talk to each other and drive themselves.

The big picture: The software-driven shift will likely have massive implications for both the automotive and semiconductor industries.

- The market for automotive computer chips is expected to grow from about $40 billion today, per IHS Markit, to as much as $200 billion by 2040, according to KPMG.

- Semiconductor companies are salivating over the growth opportunity, but it will require automakers and their suppliers to collaborate with chipmakers to seamlessly integrate hardware and software.

The state of play: Today's cars typically have as many as 100 electronic control units (ECUs), each dedicated to a separate function — the engine, the window actuators or the lane-keeping system, for example.

- As cars have gotten more sophisticated, all those ECUs, along with the wiring and power supply they require, have turned into an unwieldy and expensive mess that's inefficient and overly complex.

- "The growth of software content and associated [computer] processing ... is really breaking the current vehicle architecture," said Glen De Vos, chief technology officer at Aptiv, a major auto tech supplier.

Electronics Account for 40 Percent of the Cost of a New Car

No technology has so consistently and dramatically rebooted the car as the computer chip.

BY ERIC TINGWALL MAY 2, 2020

AUTOS

How Covid led to a $60 billion global chip shortage for the auto industry

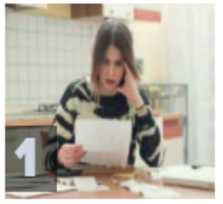
PUBLISHED THU, FEB 11 2021•7:17 AM EST

Michael Wayland
@MIKEWAYLAND

KEY POINTS

- Automakers are expected to lose billions of dollars in earnings this year due to a shortage of highly important semiconductor chips.
- Consulting firm AlixPartners expects that the shortage will cut $60.6 billion in revenue from the global automotive industry this year.

TRENDING NOW



Your tax return could be flagged by the IRS. Here's when it may happen

SEMICONDUCTORS

TSMC and Taiwan chip peers weigh new price hikes for autos

Second increase in just a few months now on table amid shortage

General Motors expects the chip shortage will cut its earnings by $1.5 billion to $2 billion this year. Ford Motor said the situation could lower its earnings by $1 billion to $2.5 billion in 2021.
Honda Motor and Nissan Motor combined expect to sell 250,000 fewer cars through March due to the shortage.

Semiconductor chips are extremely important components of new vehicles for areas like infotainment systems and more basic parts such as power steering and brakes.

Depending on the vehicle and its options, experts say a vehicle could have hundreds of semiconductors.

Higher-priced vehicles with advanced safety and infotainment systems have far more than a base model, including different types of chips.

POLITICS

Biden Administration Working to Address Chip Shortage Affecting Auto Makers

Effort will look to free up supply-chain choke points and work with producers, trade partners

Mercedes-Benz Recalls Over 1 Million Cars Over Tech Error

By Teaganne Finn

February 13, 2021, 8:45 AM MST

SHARE THIS ARTICLE

Share

Tweet

Post

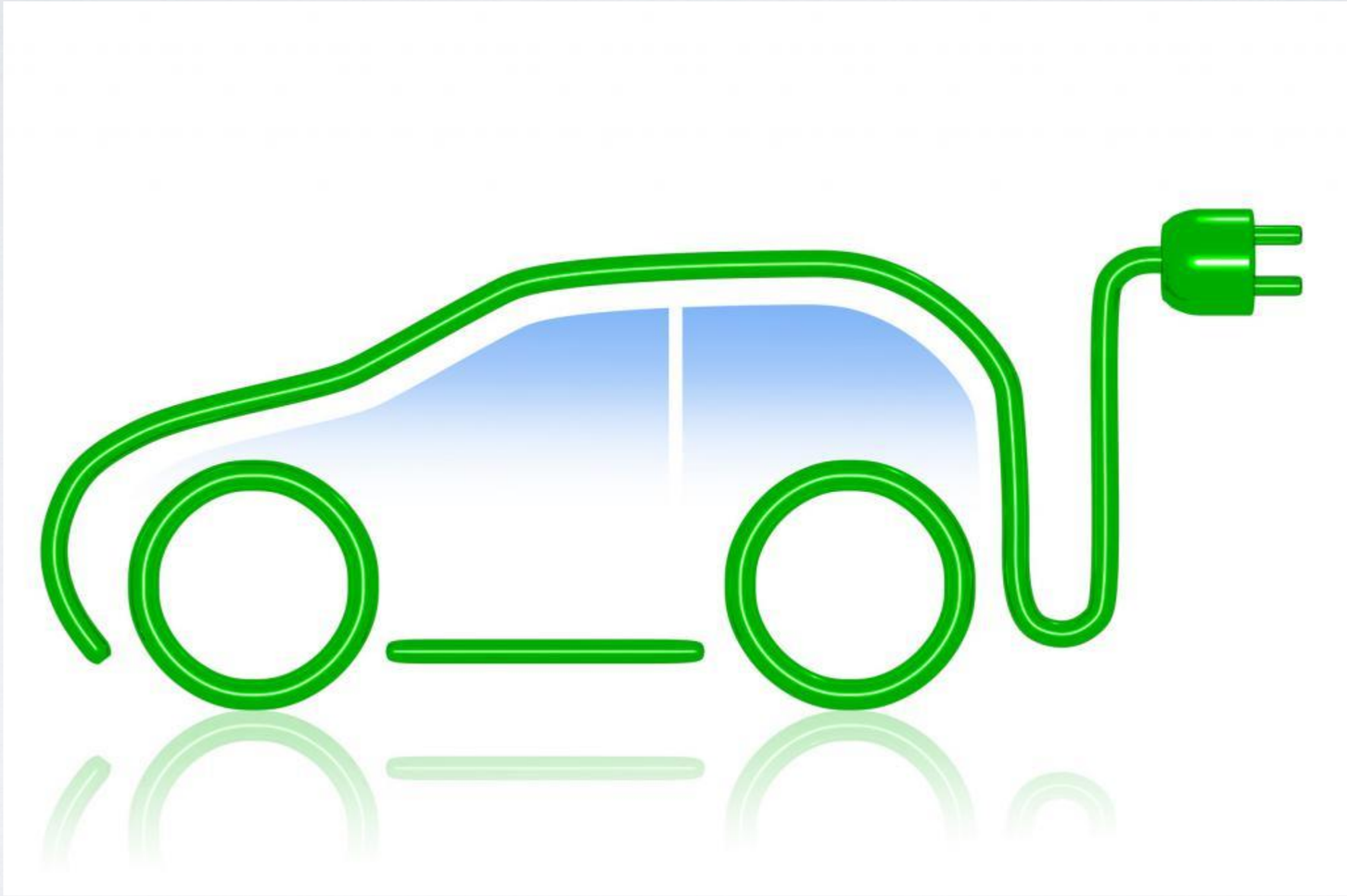
Email

Mercedes-Benz USA, LLC has recalled over 1 million vehicles for a failure in the eCall system, which has resulted in emergency responders being dispatched to wrong locations, according to the National Highway Traffic Safety Administration in a release.

The software design of the communication module may result in a failure to send the correct vehicle location for the emergency call system in the event of a crash and increase the risk of injury following a crash, says NHTSA.

And with all this software, things can go wrong

Let’s talk about Electric Vehicles (EVs)



The electric car's future starts this year, research report says

After about a decade of slow progress, 2021 is the year EVs start to turn the page and enter the mainstream, according to ABI Research analysis.

Sean Szymkowski Jan. 4, 2021 7:35 a.m. PT

LISTEN - 02:14

At least one prominent research firm says this year will mark the end of the beginning for electric cars.
ABI Research issued its 2021 Trend Report this past Wednesday and its conclusion is EVs will start trickling into the mainstream this year.

Starting in 2021, ABI Research said EVs will start to gain traction in the market, largely driven by more affordable models scheduled to start rolling into dealerships throughout this year.
By the end of this decade, EVs may make up a quarter of all new vehicles shipped. If the trajectory pans out, it would be a remarkable shift for the industry.

Electric vehicle options

Electric vehicles are made up of two main types: battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV).

Battery EVs have no combustion engine, only an on-board battery which provides energy to an electric motor.

Pure-EVs are charged from an external electricity supply, typically plugging in to an EV charge point.

When required, energy is drawn from the electric-cells and converted to motive power by the use of one or more electric motors.

The majority of **BEVs** available to buy new have a real-world driving range of 150-250 miles on a single charge, depending on the model.

As a result, electric cars are well suited for use as private cars and short-range delivery vehicles.

Fully electric vehicles are perfect for city driving, commuting, regular delivery routes, and all short- to medium-distance trips.

Plug-in hybrid EVs have an electric powertrain together with a small- to medium-sized combustion engine, which enables operation in full electric mode, using conventional fuel, or a combination of both.

Like standard hybrids, the use of a battery enables the combustion engine to be operated at high efficiency.

Unlike their conventional counterparts, PHEVs also have an ‘inlet’ socket allowing them to be charged directly from an external electricity supply.

There is a middle-ground between pure-EVs and PHEVs, the **range-extended EV (REX)**.

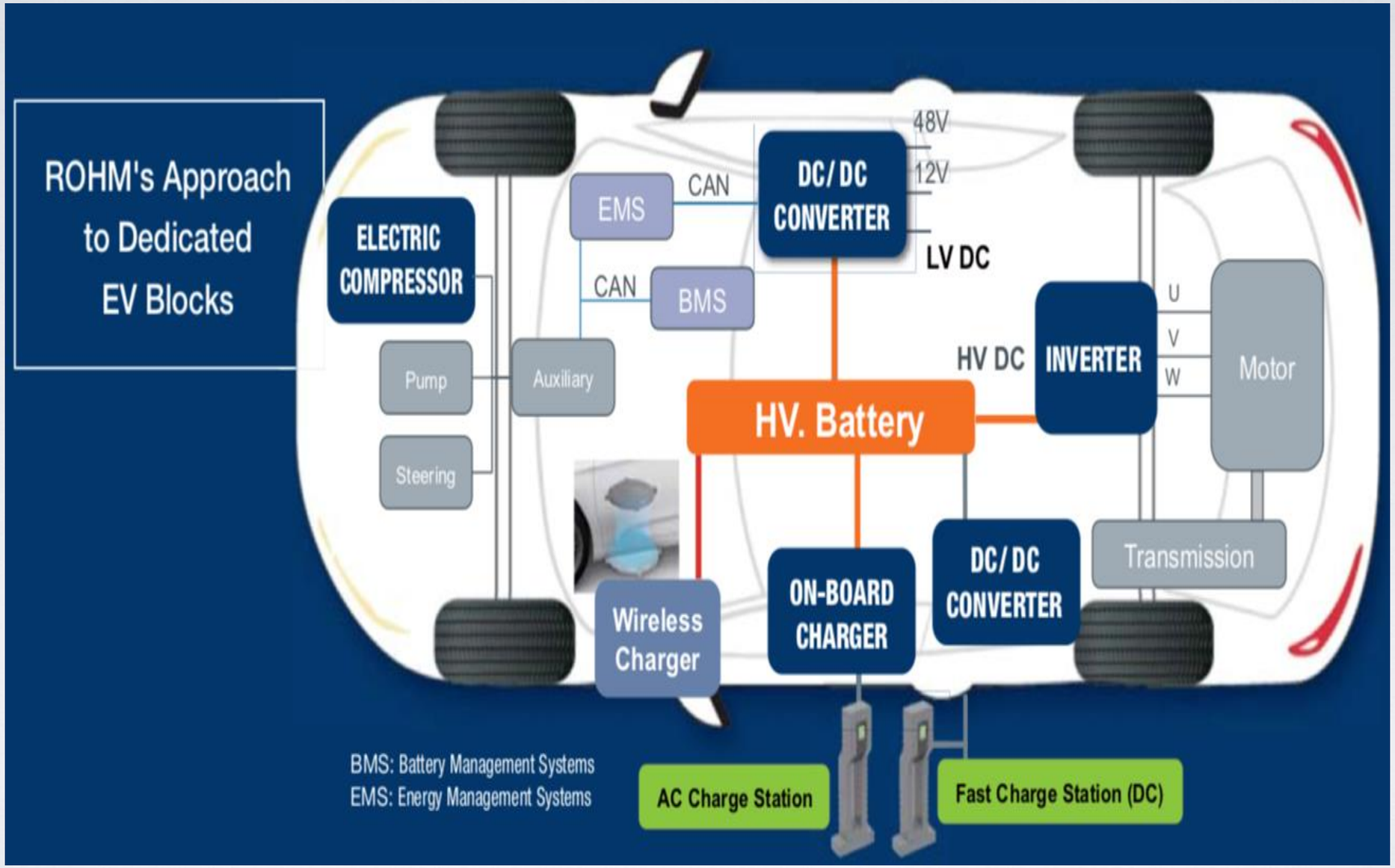
These are plug-in hybrids with a particular configuration.

In their purest form, REXs are ‘series hybrids’ with only electric motors used to drive the wheels.

In most respects the vehicle behaves like a BEV, with the battery being charged by an external supply.

However, a small internal combustion engine is available as an on-board generator to recharge the battery if required – though this never drives the wheels directly.

BEV	PHEV and REX
Longer EV range	Long driving range
Lowest running costs	Reduced running costs
Zero-tailpipe emissions	Ultra-low CO2 emissions
High equipment levels	Good refinement
Near-silent running	Electric drive for short trips



Inside a battery electric car

Ford Mustang Mach-E

Ford has taken its most prized possession, the Mustang nameplate, and extended it to a four-door electric SUV with a starting price of $43,895 (before the $7,500 federal tax credit) that's likely to attract many customers.

It's Ford's answer to Tesla's forthcoming Model Y SUV, and it looks to be the first in a line of Detroit icons adding electric vehicles to their portfolio.

Sure, the Mach-E isn't a low-slung coupe, and it has no V8—let alone a throaty muscle-car engine roar. But this performance-oriented crossover is more practical than a traditional Mustang. It's still plenty quick, has optional all-wheel drive, and doesn't consume a drop of gas or emit tailpipe pollution.

BMW i4

BMW calls its stylish new i4 electric vehicle a “four-door coupe.” This EV is projected to have a range of 300-plus miles and a fast charging system that will add about 60 miles in just 6 minutes.

The i4 also promises sports-car performance, with 530 hp and 0-to-60-mph acceleration in under 4 seconds. (It’s probably no coincidence that those acceleration numbers are similar to Tesla’s Model 3, a rival.)

The fact that BMW is bringing out an electric vehicle with a broader appeal than the quirky-looking compact i3 will give consumers in the market for sporty luxury more choices.

Cost: $70,000

Nissan Ariya

A Nissan Rogue-sized SUV, the Ariya promises to be a formidable competitor to other battery-powered SUVs, such as the Tesla Model Y and the upcoming Ford Mach-E.

While more luxurious and substantial than the Chevrolet Bolt, Hyundai Kona, and Kia Niro EVs, the Ariya will be less expensive than the Model Y. Nissan says two versions will be available—a front-wheel-drive one-motor model with 2,015 hp and an all-wheel-drive two-motor model with 389 hp.

Equipped with a long-range battery, the front-drive model has an Environmental Protection Agency-rated range of 300 miles.

Cost: $40,000 to $50,000

On sale: Late 2021

Ford F-150 EV

The F-Series pickup truck has been the best-selling vehicle in the U.S. for decades, and with all the EVs coming to market, it makes sense that Ford would add an electric option to its biggest moneymaker.

Anyone who has been following the horsepower/torque arms race among various truck manufacturers over the past few years will know that electric motors promise to be as capable as gasoline and diesel engines for use in vehicles intended to tow and haul heavy loads.

One other small advantage the electric F-150 will have over its traditional counterparts is a “frunk”—a storage compartment where the gasoline or diesel engine would have lived.

Ford says both the truck and its batteries will be built at the company’s River Rouge manufacturing complex in Dearborn, Mich. There will also be an F-150 hybrid.

Cost: $75,000

On sale: Mid-2022

ADAS: Everything You Need to Know

When properly designed, these systems, referred to also as ADAS, use a human-machine interface to improve the driver's ability to react to dangers on the road.

BY HEARST AUTOS RESEARCH

What are ADAS?

Advanced driver-assistance systems, are technological features that are designed to increase the safety of driving a vehicle. LogisFleet explains that when properly designed, these systems, referred to also as ADAS, use a human-machine interface to improve the driver's ability to react to dangers on the road.

These systems increase safety and reaction times to potential through early warning and automated systems. Some of these systems are built standard to certain vehicles, while aftermarket features and even entire systems are available to add at a later date to personalize the vehicle to the driver.

The United States Department of Transportation's National Highway Traffic Safety Administration (NHTSA) announced in 2014 that all new vehicles under 10,000 pounds (4,500 kg) are required to have rear-view cameras by 2018. The catalyst for this change was the Cameron Gulbransen Kids Transportation Safety Act of 2007 after a child was killed by a car backing out of a driveway.

In addition to these back-up cameras, vehicle manufacturers have developed several other technologies to boost safety. An example is the 2013 Cadillac ATS, which had General Motors' first vibrating safety alert driver's seat, which vibrated when a driver began to drift out of a lane or when oncoming danger was detected.

How do ADAS work?

Most late-model vehicles have ADAS built into their original design and are updated as automobile manufacturers introduce new vehicle models and more features. These systems use multiple data inputs to enable useful safety features. Some of these data sources include automotive imaging, which is a series of high-quality systems of sensors that mimic and exceed the capabilities of the human eye in terms of 360-degree coverage, 3D object resolution, high visibility in difficult weather and lighting situations and real-time data.

LiDAR (light detection and ranging) adds more cameras and sensors for computer vision that transform outputs into 3D with the capability to discern between static and moving objects for added layers of blind-spot or bad-lighting situations.

Additional inputs can be obtained from other sources not part of the primary vehicle platform, including other vehicles (V2V) or vehicle-to-Infrastructure (V2X) – WiFi, for example. Future-generation ADAS will continue to plug into wireless network connectivity to provide higher safety and monetary value by using V2V and V2X data.

Staying In The Lane

Lane Departure Warning (LDW) is a passive technology that looks for the painted lane lines on the road and notifies the driver if they are crossing over (sometimes it’s called lane departure alert).

The sensors used for LDW can also be used for Lane Center Assist (LCA) or Lane Keep Assist (LKA).

Both are active technologies that automatically adjust the steering to keep the vehicle centered in the lane (LCA) or from crossing lane markers (LKA).

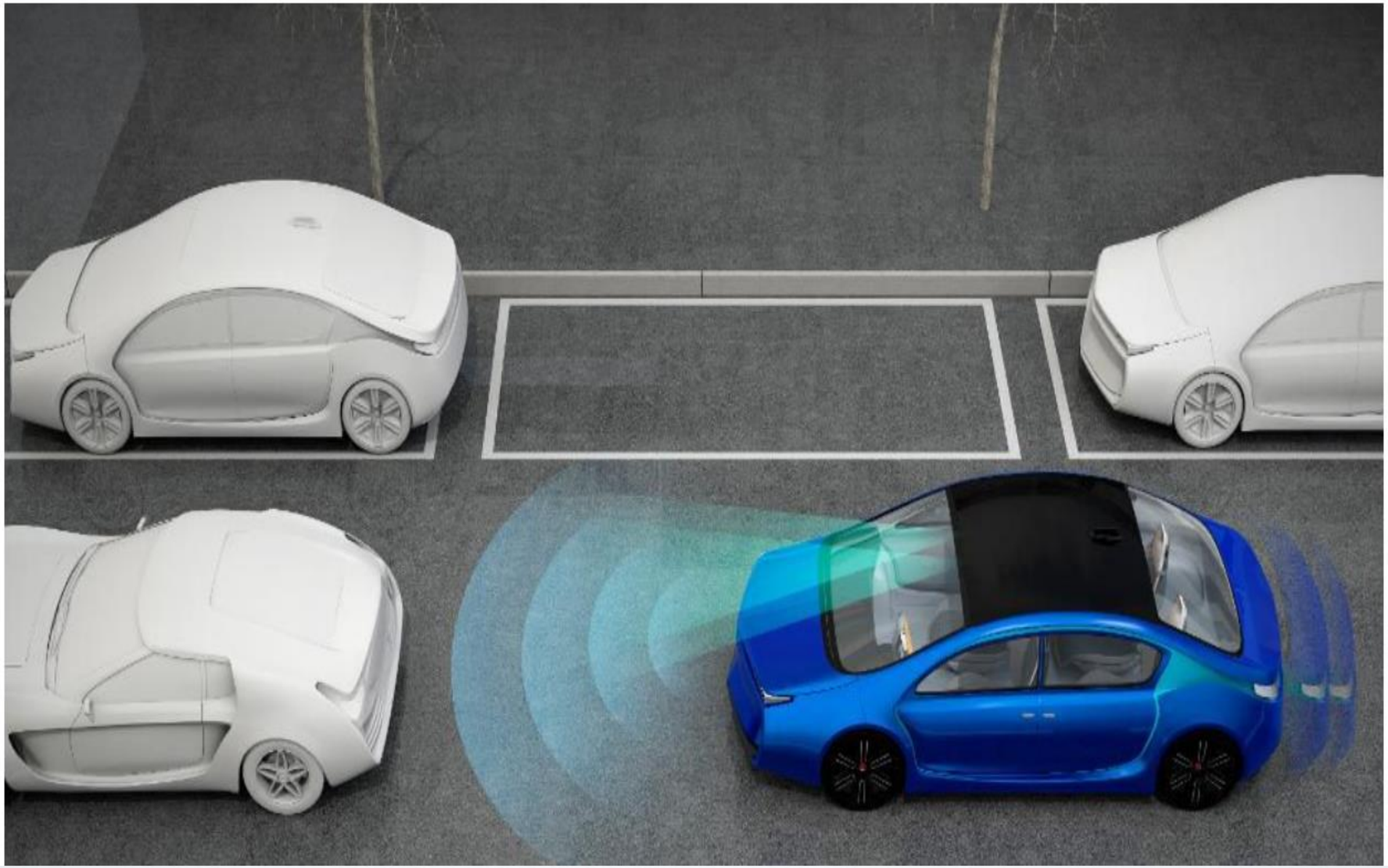
It's Called "Blind-Spot" For A Reason

Seeing behind the vehicle is a large component of advanced safety technology (backup cameras have been mandatory in new cars since 2014). A blind spot monitor looks for other vehicles on the side or rear of the vehicle.

Alerts from this technology can be audible, visual or haptic (vibrations in steering wheel or seat cushion). Cross traffic alert or rear cross-traffic alert is a warning that sounds when it senses vehicles or objects approaching from the side or rear when the vehicle is in reverse.

Rear automatic emergency braking (Rear AEB) automatically applies the brakes when it detects approaching vehicles or objects (including pedestrians). Cameras that display a 360-degree view of everything surrounding the vehicle are also commonly used to prevent accidents in any direction at slow speeds.

Preventing Head-On Collisions

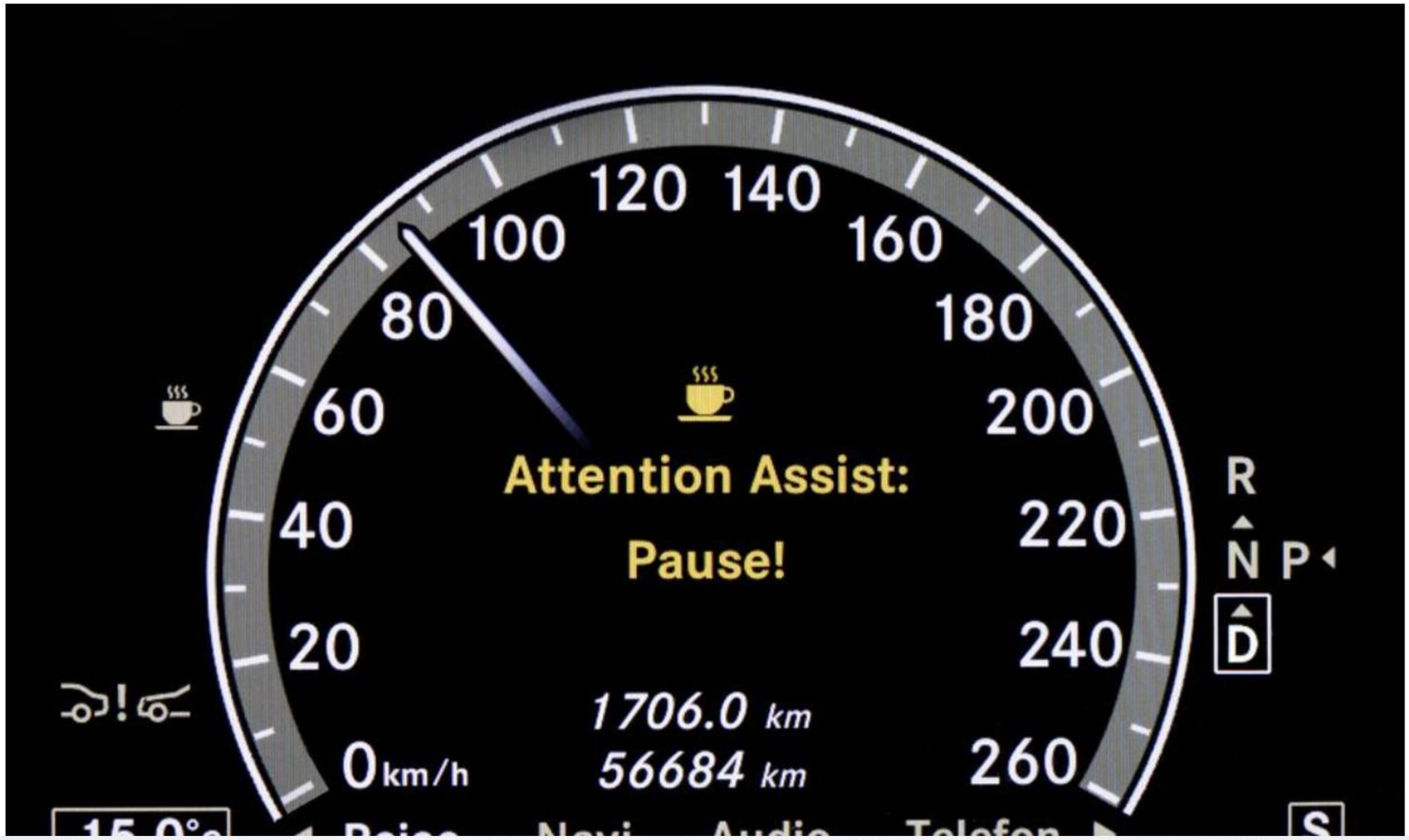


Systems such as Forward Collision Warning (FCW) look ahead of the car when forward travel is expected or occurring.

FCW calculates whether the car is getting too close to another vehicle directly in its path and send an alert to the driver.

Automatic Emergency Braking (AEB) responds by automatically applying the brakes. AEB systems can vary depending on speed (some only work at “city” speeds while others will engage at highway speeds).

Fighting Driver Fatigue



Some safety systems monitor patterns inside the vehicle.
Driver drowsiness detection tracks the driver's eyesight or the movement of the steering wheel to detect sleepy, distracted or inattentive behavior.
Some cars with LKA or LCA leverage the sensors in the steering wheel to detect a lack of human interaction.
Many systems use an icon that lights up in the instrument panel to get the driver's attention. Others use a bright light accompanied by a tone.

Technology & Safety Features

If you live for tech, we speak your language

The all-new Rogue drives you into the future with some of the most cutting-edge technology on the road.

- Head-Up Display[1]
- Digital dashboard with fully digital gauges[1, 2, 3]
- Wireless Apple CarPlay® integration (late availability)[1, 4, 5]

The future is right in front of you

Screens and Displays

Head-Up Display Keep your eyes on the road with the largest Head-Up Display in its class.[7] Rogue projects key driving data onto your windshield, directly in your line of sight to help keep you informed and in control behind the wheel.[1]

- Know Rogue's ProPILOT Assist status[8]
- Get directions, without having to look away[9]
- See incoming calls, music, and more[10]

Self Driving Vehicles

Waymo LLC is an American autonomous driving technology development company.

It is a subsidiary of Alphabet Inc, the parent company of Google.

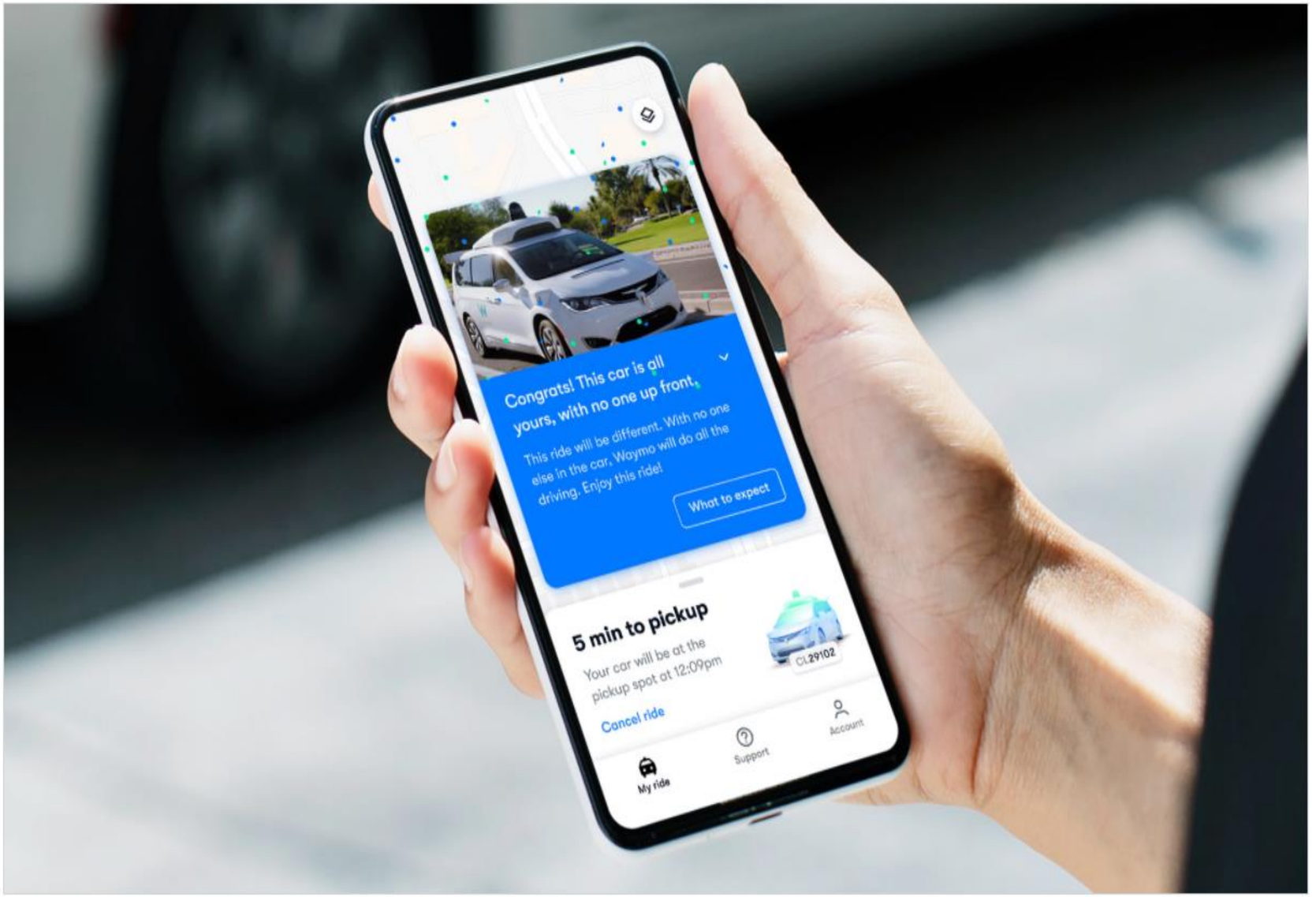
STATE

Waymo's driverless ride service moves metro Phoenix toward autonomous future

Google (Waymo) has been testing in the Phoenix area for some time
Now they offer an actual service in the Chandler area

October 8, 2020

Waymo is opening its fully driverless service to the general public in Phoenix



WAYMO ONE

John Krafcik, CEO

Waymo operates in about a 100-square-mile area.

The driverless or “rider only” service area that will be offered to Waymo One members is about 50 square miles, Krafcik said.


What's it like in a Self Driving Car?
WAYMO

QUESTIONS ?