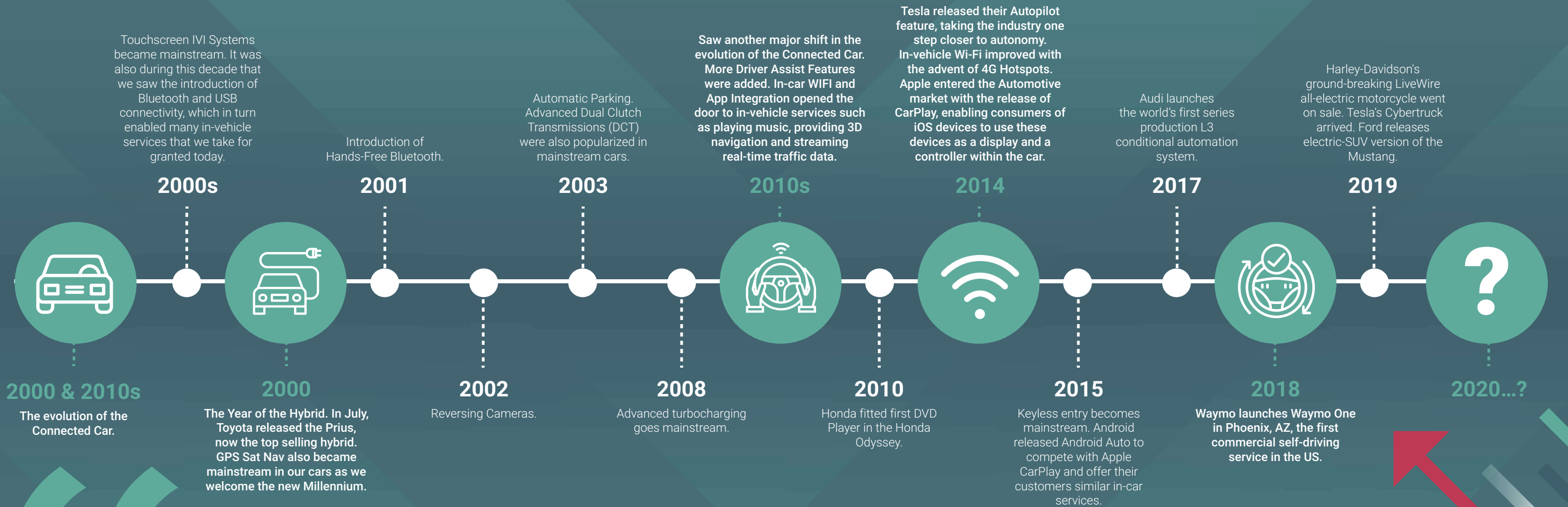


2000-2020: 20 YEARS OF AUTOMOTIVE TECHNOLOGY



WHAT IS THE STANDOUT PIECE OF AUTOMOTIVE TECHNOLOGY FROM THE PAST 20 YEARS IN YOUR OPINION, AND WHY?

Here's what our partners had to say:

Dave Zoia, Executive Director - Research, **Wards Intelligence**: "The lithium-ion battery. Electrification is one of the biggest driving forces in the industry today, and the inevitable migration to fully electric vehicles wouldn't be possible without the development of an automotive-grade lithium-ion battery."

Phil Magney, Founder & Principal, **VSI-Labs**: "Connectivity is the standout technology that has enabled a new era of location-aware services, largely safety and entertainment. And for the next era of automated driving and new mobility services, connectivity becomes the lifeblood."

Juergen Daunis, Head of IoT CV Sales Engagement, **Ericsson**: "Electric Vehicle has a huge impact,

replacing big part of the traditional value chain and enabling new players to enter the market."

William Rotramel, Consultant, **AVL**: "I believe this would have to be the automotive microcontroller. Automotive electronics advancements have been the enabler to many improvements in the light duty vehicle segment. They have enabled incredible reductions in vehicle emissions and improvement in fuel efficiency. They have enabled the modern HEV and EV to become a real alternative to ICE powered transportation. The microcontroller processing speed and software advancements have improved vehicle safety by enabling the control of multistage airbags, side curtain and side seat bag protection, pre-crash control of belt restraints and active safety with ESC, ABS and AEB and smart cruise control functions. In addition,

telematics has brought new entertainment streaming into the vehicles and allowed for additional safety through crash information and vehicle location features which can activate without driver interaction."

Bob Gritzinger, Industry Analyst, Advanced Propulsion and Technology, **WardsAuto**: "Adaptive cruise control, and specifically, full-range adaptive cruise control that can manage a vehicle's speed from expressway speed down to stop-and-go. Like the simple speed control that preceded it, adaptive cruise control is relatively simple to add to vehicles as manufacturers add radar sensors necessary to meet forward collision warning and automatic braking objectives. And like traditional cruise control, once drivers begin to use it and understand its capability and dependability, (or lack thereof,

depending on the vehicle), they'll come to use it and rely on it. The net effect is a generally safer driving public as rear-end collisions diminish in either number or severity, even though more and more drivers are heavily distracted behind the wheel."

Andrew Jackson, Research Director, **PTOLEMUS**: "Emissions. The progress that has been made with forced induction (i.e. turbocharging, and more specifically variable lane technology) has been critical. As with it, engines have been downsized which has helped to reduce/offset the mass of the overall vehicle and increase engine efficiency. Broadly speaking, comparing a car from 2020 (in terms of physical size/mass) to one from 2000 suggests that cars have improved around 46% in terms of fuel consumption (though this is based on manufacturers' claimed consumption figures).

I deliberately exclude hybridization from this as the technology has been niche till now, but I think this will explode over the next 10 years at least. Not least due to Regulation (EU) 2019/631 which is forcing manufacturers to lower the fleet emissions of their vehicles rapidly.

Paul Myles, Editor-In-Chief, **TU-Auto**: "Connectivity has been, and will continue to be, the greatest change to the automobile since the internal combustion engine became the powertrain of choice more than 140 years ago. That's because it not only opens the door to a myriad of potential services for helping automakers and service providers to engage with consumers at an individual level, it will be a key component in securing robust and reliable autonomous driving capabilities in years to come."

