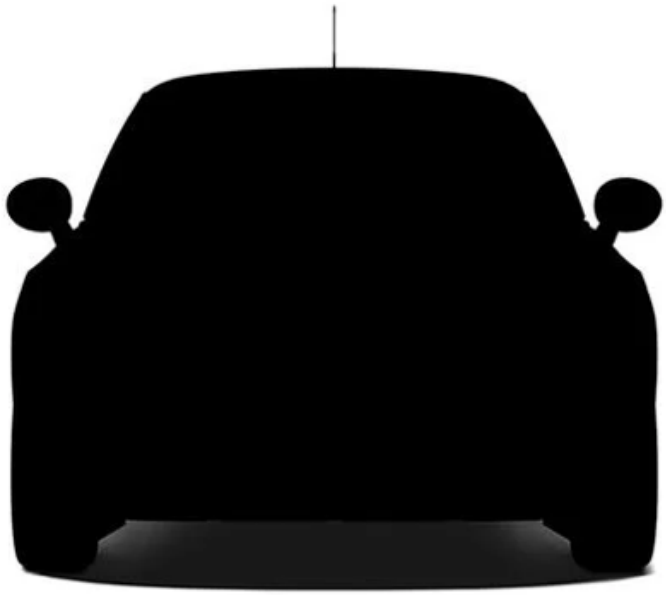
Apple Car

Apple's vehicle project, focused on building a fully autonomous car.

on July 11, 2022



At A Glance

- Hundreds of Apple employees are working on developing a self-driving Apple-branded car aimed at consumers.

What We Know

- Physical car project still in the works
- Deep integration with iOS expected
- Autonomous testing permit received from DMV
- Self-driving software being tested

Apple's Car Project: Everything We Know

In 2014, Apple began working on "Project Titan," with upwards of 1,000 car experts and engineers developing an electric vehicle at a secret location near the company's Cupertino headquarters.

The Apple Car project has shifted and changed multiple times over the course of the last several years due to internal strife and leadership issues, but development is on track. Though 2016 rumors suggested Apple had shelved plans for a car, by 2020, it was back on.

Apple is now rumored to be working on a fully autonomous self-driving vehicle that will not require user intervention to drive, going further than any other car manufacturer to date. It's a highly ambitious project, and rumors indicate that Apple wants to design a car with no steering wheel and no pedals.

Apple's AI and machine learning chief John Giannandrea is heading up the Apple Car project, and Kevin Lynch, known for his work on the Apple Watch, has also joined the Car team and it said to be largely responsible for Apple's push toward a self-driving car.

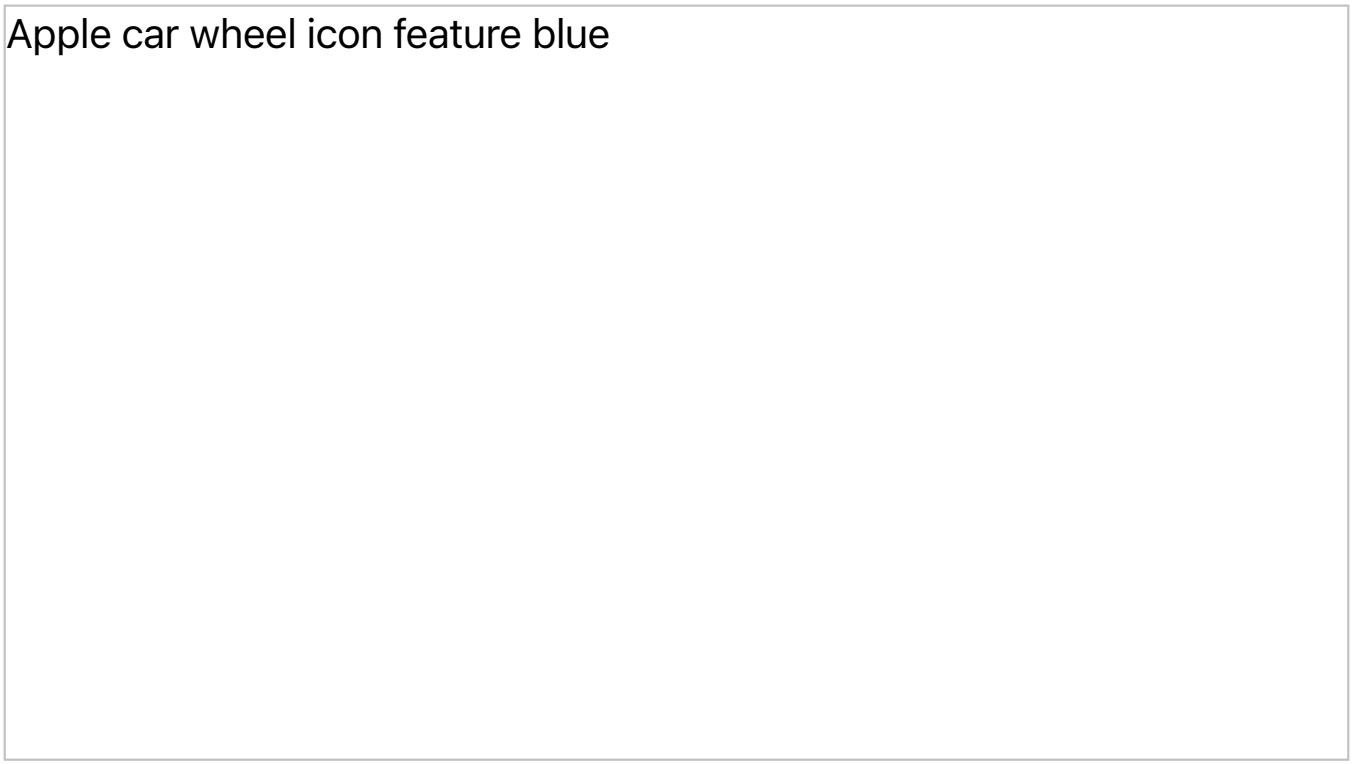
There is a high-powered Apple-designed chip in the Apple Car, and it is the most advanced component that Apple has developed to date. It's made from neural processors that can handle the incredible AI load needed for an autonomous vehicles. TSMC is expected to manufacture the chip, and that's the same company that makes chips for the iPhone, iPad, and Mac.

Because Apple has no experience with car manufacturing, it will need partners to produce the vehicle, and Apple is said to be working on securing partnerships in the automobile industry. It is not yet known who Apple will work with, but it has held discussions with Hyundai and other companies.

The Apple Car has been described as Apple's "next star product" with

Apple able to offer "better integration of hardware, software and services" than potential competitors in the automotive market. The Apple Car is likely to be marketed as a "very high-end" model or "significantly higher" than a standard electric vehicle.

Apple car wheel icon feature blue

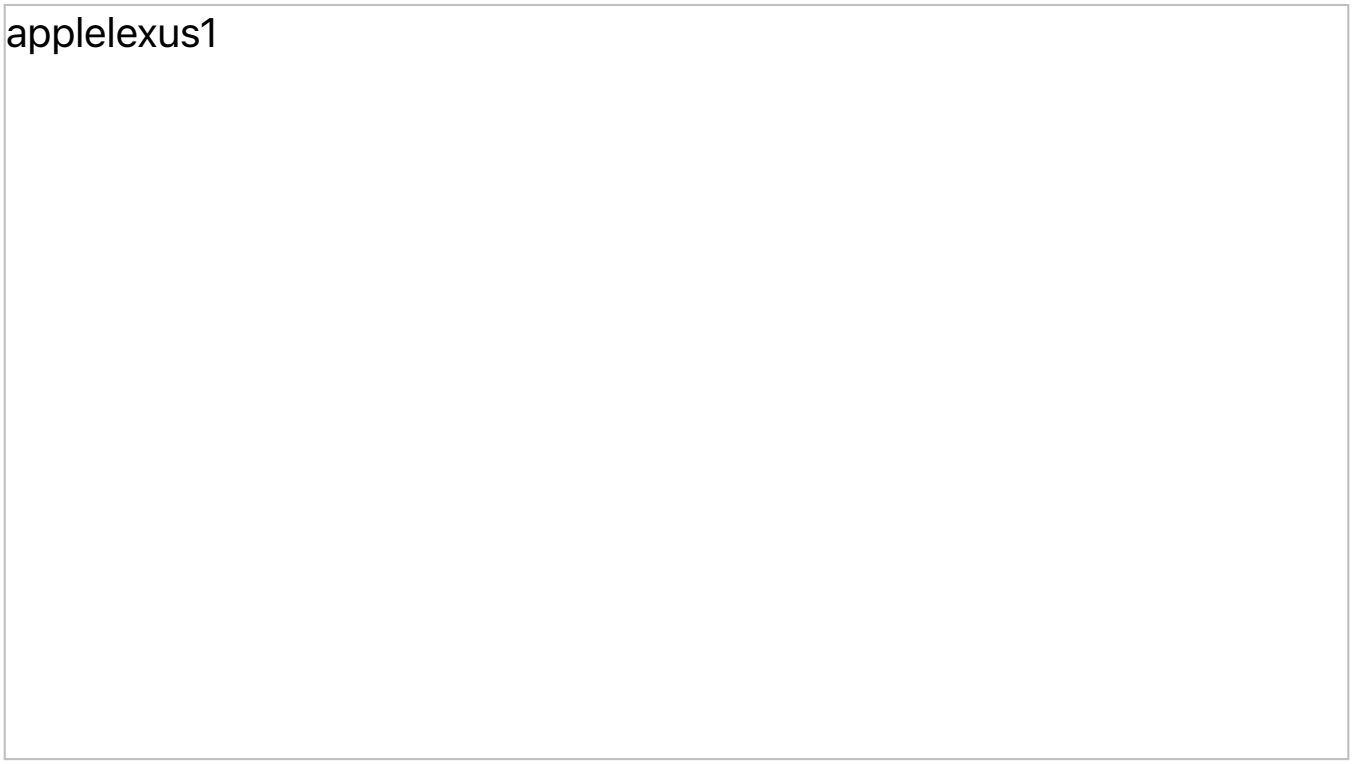


In June of 2017, Apple CEO Tim Cook spoke publicly about Apple's work on autonomous driving software, confirming the company's work in a rare candid moment. Apple doesn't often share details on what it's working on, but when it comes to the car software, it's harder to keep quiet because of regulations.

> *"We're focusing on autonomous systems. It's a core technology that we view as very important. We sort of see it as the mother of all AI projects. It's probably one of the most difficult AI projects actually to work on." -- Apple CEO Tim Cook on Apple's plans in the car space.*

Since early 2017, Apple has been testing self-driving vehicles on public roads in California, using several 2015 Lexus RX450h SUVs leased from Hertz. The SUVs have been spotted on the streets of Cupertino host of sensors and cameras as Apple prepares its self-driving software, and

testing has ramped up over the years. Apple has more than 60 test vehicles out on the road.



Apple is aiming to launch its autonomous car by 2025, but given the ambitious nature of the project, it might not make that target date or could ultimately see the project delayed.

We still have years to go before an Apple Car is ready to debut, and we'll likely hear much more about the project as Apple will need to seek deals with a whole new set of supply chain partners in order to manufacture a vehicle.

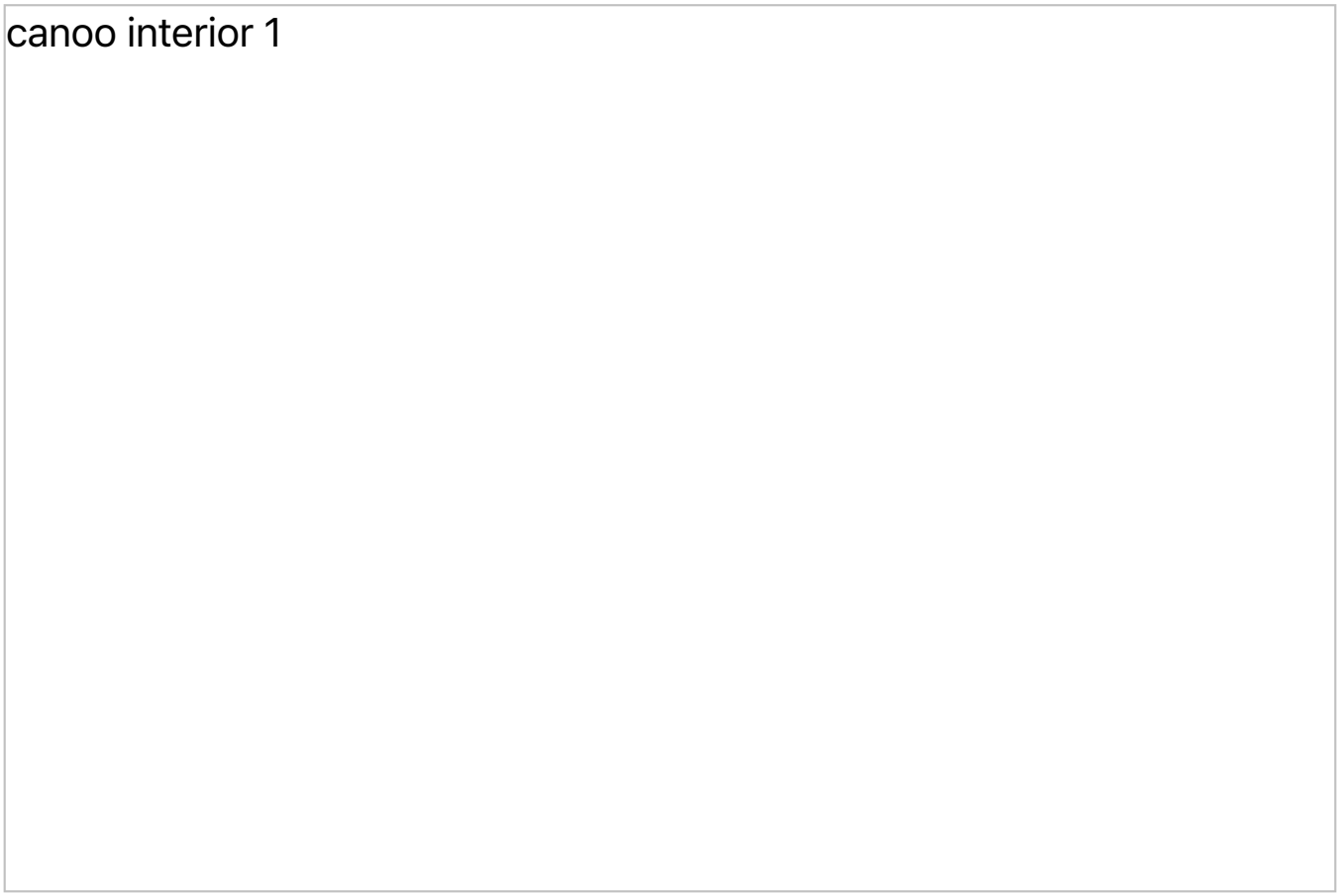
Design and Self-Driving Capabilities

Bloomberg's Mark Gurman in late 2021 broke the news that Apple has decided to go all-in on its car project, designing a fully autonomous vehicle. Apple is "refocusing" its car project around a self-driving vehicle that will require no interaction from the driver, a goal that other car manufacturers like Tesla have yet to achieve.

Apple was pursuing two vehicle paths. One with limited self-driving capabilities and a second with full self-driving functionality, and Apple has now decided to pursue the second path under the leadership of Kevin Lynch.

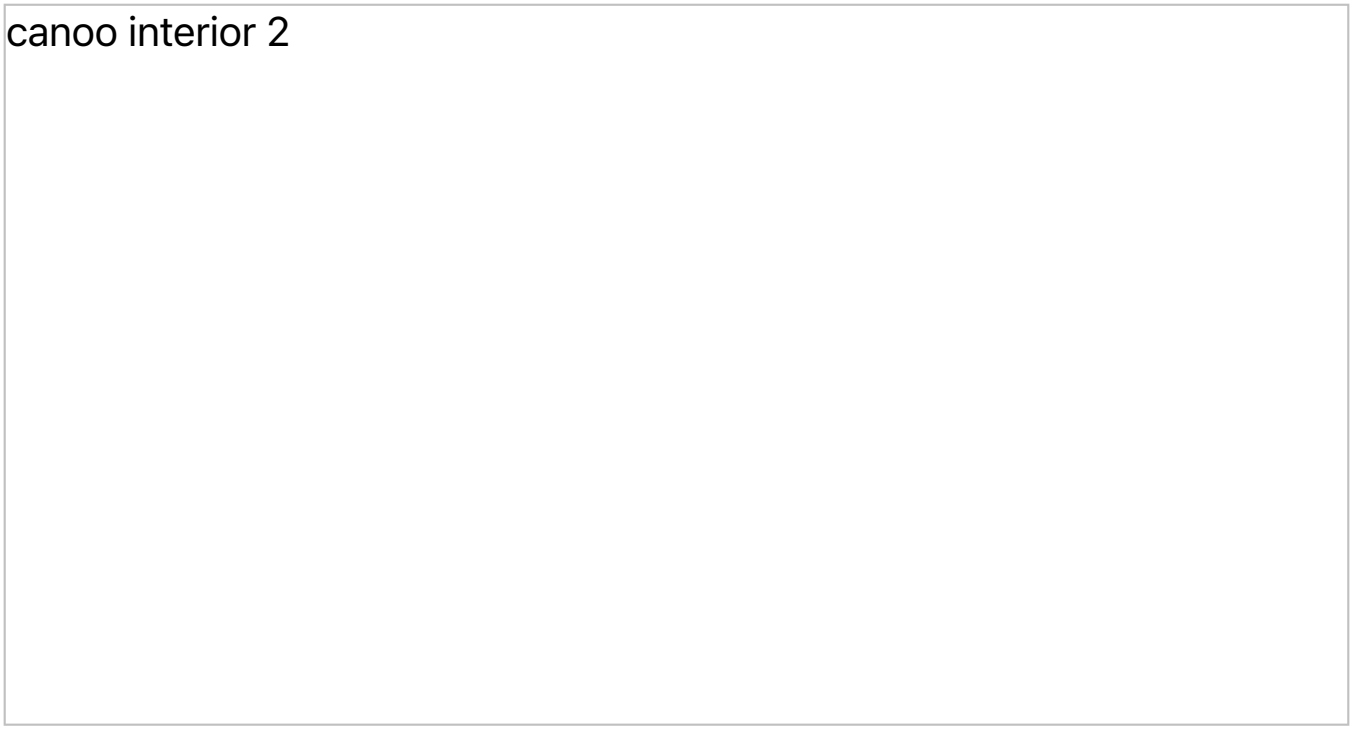
No Steering Wheel or Pedals

Apple wants to design a vehicle that does not have a steering wheel or pedals, with an interior focused on hands-free driving. According to *Bloomberg*, Apple has discussed a design that would be similar to the Lifestyle Vehicle from Canoo.



Canoo Lifestyle Vehicle's interior

In this car, riders sit along the sides of the vehicle rather than in standard front and back seats. Apple may not be able to remove the steering wheel, however, as it could be useful to have available in an emergency situation.



Canoo Lifestyle Vehicle's interior

With no steering wheel, there would also be no need for foot pedals for controlling acceleration and braking, so it's possible that Apple could also leave these out. It's not yet clear if Apple's ambitious design plans will pan out, so it could ultimately be more similar to a traditional car. In order to release a vehicle without a steering wheel or brake pedal, Apple hoping to get exemptions from the U.S. National Highway Traffic Safety Administration.

Chassis

Apple is aiming for an ambitious design that is unlike any existing car, according to a report from *The Information*. Former Apple design chief Jony Ive is involved with the project as a consultant, and he believes the Apple Car team "should lean into the weirdness of the vehicle's design and not try to hide its sensors."

The car is said to feature four seats that face inward, allowing passengers to have face-to-face conversations with one another, plus it has a curved

ceiling that resembles the roof of a Volkswagen Beetle

Apple designers are testing a trunk compartment that raises up for easy access and then lowers back down when not in use. The designers have also considered large seat-back screens that raise and lower.

Infotainment System

Apple has considered designs with a large iPad-like touch screen in the middle of the vehicle, which would not be too dissimilar from the design of Tesla vehicles. Users would be able to interact with the central panel, and it would be integrated with Apple's current devices and services.

Processor

The processor that's in development for the car was created by Apple's silicon engineering group, which has also created the processors for the M1 Macs, iPhones, and other devices. *Bloomberg* describes this chip as the most advanced component that Apple has designed internally.

It's said to be made up of neural processors that are able to handle the artificial intelligence requirements of autonomous driving. The chip runs out, and may need a sophisticated internal cooling system.

An *EETimes* analyst suggested the chip could be called the "C1" and could perhaps be based on the A12 Bionic processor.

Safety

Safety is a major focal point in the design of the Apple Car. Apple wants to create a safer vehicle than companies like Tesla or Waymo, and so engineers are building in redundancies and backup systems that will kick in to avoid driving system failures.

Removing the steering wheel of the vehicle may ultimately be impossible if Apple wants to make the vehicle as safe as possible for drivers.

Charging and Battery

The Apple Car could be compatible with the Combined Charging System, a standard used for charging electric vehicles. Companies like Tesla, BMW, Ford, General Motors, Kia, Hyundai, and others all support the CCS, and adopting the same standard would allow Apple Car owners to use charging stations that are already available.

Apple is developing a new battery design that has the potential to "radically" reduce the cost of batteries and increase the vehicle's range. Apple is creating a "monocell" design that will bulk up the individual battery cells and free up space inside the battery pack by removing pouches and modules that hold battery materials. This will allow for more active material in a smaller package. The battery technology has been described as "next level" and similar to "the first time you saw the iPhone."

Sensors

Apple has held talks with four suppliers of LiDAR sensors that are smaller, more affordable, and more easily mass produced than current LiDAR systems, which are too bulky and expensive for use in mass produced vehicles. Apple is aiming for a "revolutionary design" that could potentially be used in a future autonomous vehicle.

Cost

The Apple Car is likely to be marketed as a "very high-end" model or "significantly higher" than a standard electric vehicle.

Possible Partnerships

As of early 2021, multiple rumors have suggested that Apple has entered into negotiations with well-known automative electronics suppliers for components for a potential upcoming vehicle-related product, and Apple is also said to be working to establish a production facility in the United States.

Apple was rumored to be cosidering a partnership with Hyundai for manufacturing the Apple Car, with plans to transition the Apple Car development to its Kia brand as part of an arrangement that could see production happen in the United States, but that hasn't panned out.

Rumors suggested that under the partnership with Hyundai, Hyundai Mobis would be in charge of design and production for some Apple Car components, and Hyundai Group affiliate Kia would provide the U.S. production line for Apple Cars. Hyundai executives were said to be divided over the prospect of a deal with Apple, though Apple planned to invest 4 trillion won ($3.6 billion) in Kia Motors, with Kia set to manufacture the Apple Car in its U.S. facility located in Georgia.

Apple reportedly considered Hyundai-Kia because the deal would give Apple access to an established automaker with the capability to produce vehicles in North America. Hyundai-Kia was also willing to give Apple control over both the Apple Car software and the hardware, with Apple planning for a full Apple-branded vehicle and not a Kia model that included Apple software.

Despite all the rumors of an Apple/Hyundai-Kia partnership, Apple paused the talks and has also been discussing Apple Car plans with other automobile manufacturers. According to *Bloomberg*, Apple was upset that Hyundai confirmed that it was in talks with Apple even though Hyundai eventually retracted and revised the statement.

Hyundai and its Kia affiliate confirmed in February 2021 that they are not in discussions with Apple to cooperate on the development of a self-

driving electric vehicle, so it appears the discussions between Apple and the two car manufacturing companies may have been tabled for now. It's not clear if the talks will resume, but some Korean media sites do believe that the partnership could survive and Apple could opt to go with Kia.

Apple also allegedly approached Nissan about a potential partnership, but negotiations were brief and did not make it up to executive levels due to disagreements over Apple Car specifics. The two companies clashed over the idea of a partnership, with Nissan worried that Apple would downgrade it to a simple hardware supplier. Apple wants full control over the Apple Car's design and software, and Nissan has said that it has no plans to change the way that it makes cars. Nissan has since confirmed that it is not in talks with Apple.

According to Apple analyst Ming-Chi Kuo, Apple's initial vehicle chassis could be based on Hyundai's E-GMP electriv vehicle (BEV) platform, which uses up to two motors, five-link rear suspension, an integrated drive axle, battery cells that can provide range over 500km on a full charge, and can be charged up to 80% within 18 minutes through high-speed charging. A high performance model based on E-GMP is capable of accelerating from 0-60 miles per hour in less than 3.5 seconds, with a top speed of 160 miles per hour.

csm hyundai ev platform apple car

Apple may also work with General Motors and European manufacturer PSA for subsequent models or in other markets. Apple's "deep collaboration" with manufacturing partners will shorten Apple car development time.

Bloomberg's Mark Gurman has explained that Apple is struggling to find an appropriate existing automaker to build its vehicle and automakers are said to be concerned about the implications of such an agreement on their own brand. As a result, Apple is reportedly looking into contract manufacturers such as Foxconn, which has an existing relationship with the company.

Foxconn is the main assembler of iPhones, and also recently unveiled an electric vehicle chassis and a software platform to help carmakers bring models to market faster. Contract manufacturer Magna is purportedly another possibility, but Apple may also choose to manufacture the vehicle itself.

According to *The Korea Times*, Apple is "very near" to signing an agreement with LG Magna e-Powertrain. Apple is apparently comfortable with LG Magna e-Powertrain's smaller manufacturing capacity, from which it may be inferred that the company does not intend to produce the vehicle on the same large scale as other major automakers. Apple's first-generation of electric vehicles is reportedly seen as an opportunity to evaluate the project's marketability, rather than a true mass-market vehicle.

If the agreement with LG Magna e-Powertrain is reached, the two parties will then jointly establish the precise details for the production of the Apple car, and a prototype will apparently be teased in early 2024.

Apple in June 2021 entered into "early stage talks" with two Chinese companies that would be able to supply batteries for a future Apple Car. Apple discussed battery options with CATL and BYD, with Apple pushing

for the building of manufacturing facilities in the United States. CATL and BYD refused to set up teams dedicated to Apple and plans in the U.S., so talks fizzled out.

Apple may instead be planning to work with Taiwanese manufacturers on batteries that are could be made in the U.S. Taiwan-based Foxconn and Advanced Lithium Electrochemistry both plan to set up factories in the United States that could end up manufacturing batteries for the Apple Car.

Apple in 2021 also sent a team of Apple Car employees to South Korea to meet with LG, the SK group, and others to discuss possible business opportunities related to the Apple Car. Apple is continuing to work to find new partners to join its supply chain for the upcoming vehicle. Apple is pursuing companies who can make lithium iron phosphate batteries, which Korean suppliers mass produce.

Apple in September was rumored to be visiting Toyota as talks to find and secure suppliers continue.

An Apple parts manager in 2020 allegedly told Japanese auto supplier Sanden that Apple was working on an electric vehicle, and he provided Sanden with schematics of an electric car and air conditioner parts. Sanden creates air conditioner parts for vehicles, and the company did hold talks with Apple, but Sanden faced financial troubles because of the ongoing pandemic and the Apple Car talks faded.

Apple representatives also visited South Korea last year to meet with suppliers, and Apple is said to be seeking a number of vehicle electronic parts manufacturers with experience in mass production to provide Apple Car components.

Apple is allegedly working on the chip modules and packages or the autopilot functions of the Apple Car, partnering with an outsourced

semiconductor assembly and test company (OSAT) located in South Korea. The project is led by Apple's regional offices in South Korea.

Existing Apple suppliers are also hoping to produce components for the Apple Car. Foxconn has an EV manufacturing arm and is working on a software platform for carmakers, while Luxshare is working with Chinese automaker Chery to build EVs. Apple isn't likely to work with either company directly on a car, but they could have key roles in the company's Apple Car supply chain.

German carmaker Porsche has apparently discussed undertaking joint projects with Apple. The company's CEO Oliver Blume said in March 2022 that Porsche discussed "exciting common projects" with Apple, but that it was too soon to make any firm decisions on future projects. It is not clear if Blume was referring to something related to the Apple Car or something more like CarPlay.

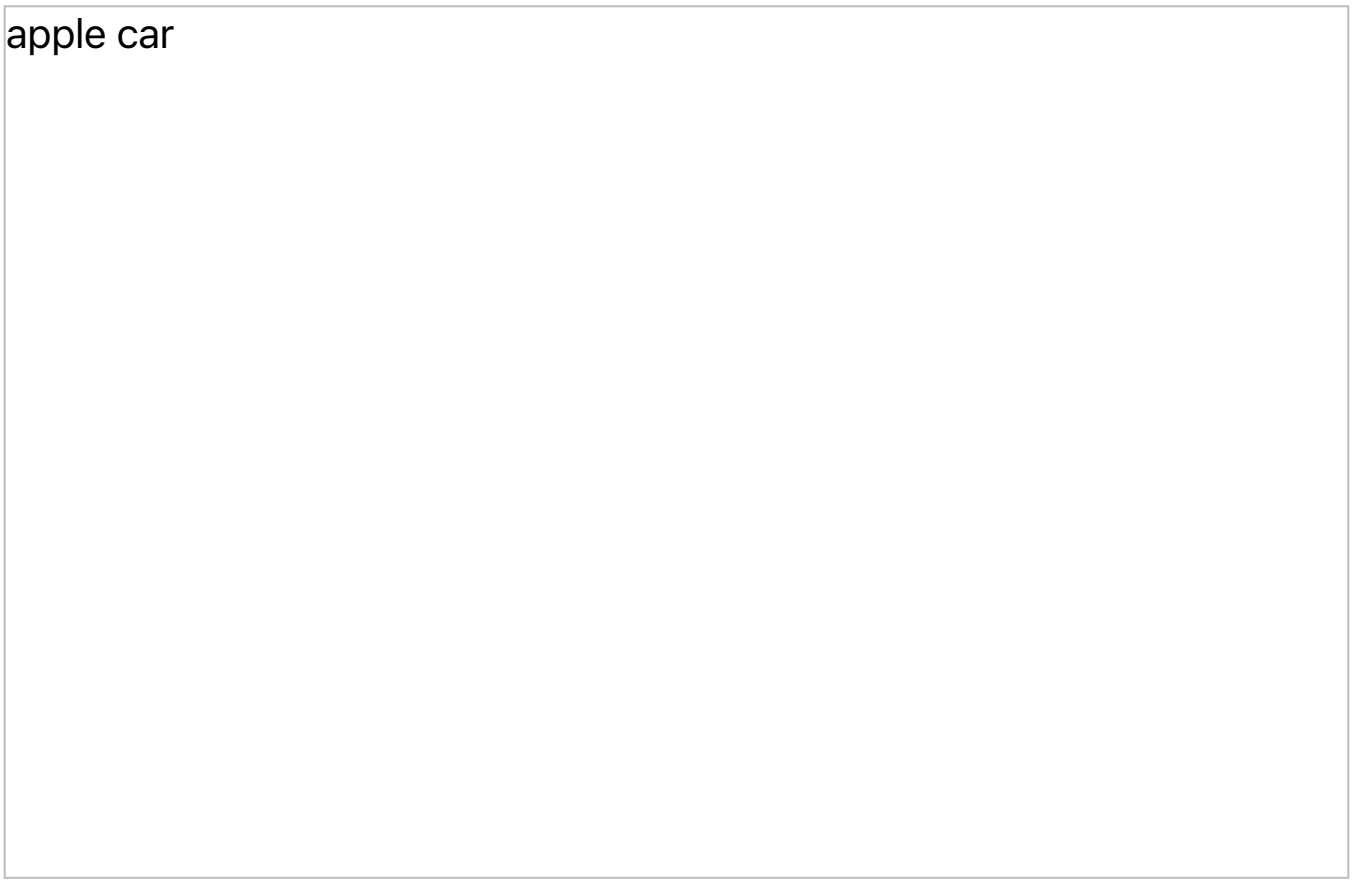
Apple Car Development History

Apple's interest in a car dates back to before the original iPhone, and Apple executives discussed building a car before the device launched. Steve Jobs considered developing an Apple car, and even met with the manufacturer of the lightweight, inexpensive "V-Vehicle" in 2010, but is said to have ultimately decided not to work on a car in 2008, preferring instead to focus development on the iPhone.

With the iPhone now secure as Apple's most profitable device, Apple has turned to other avenues of research and development, once again exploring the possibility of a car-related project. The first details on the Apple Car started leaking out at the beginning of 2015.

In February of 2015, a mysterious van leased to Apple was spotted driving around streets in Northern California. The van had a camera rig attached to it with multiple cameras, leading to speculation that Apple was using it

to develop a product similar to Google Street View. More outlandish speculation ranged towards the possibility of a self-driving vehicle, but people who spotted the vans quickly determined the vans had drivers. Apple later came out and said the vans were related to a mapping project, but they were undoubtedly the catalyst that led to the discovery of Apple's secret on a car.



One of the mysterious vans driving around the Bay Area

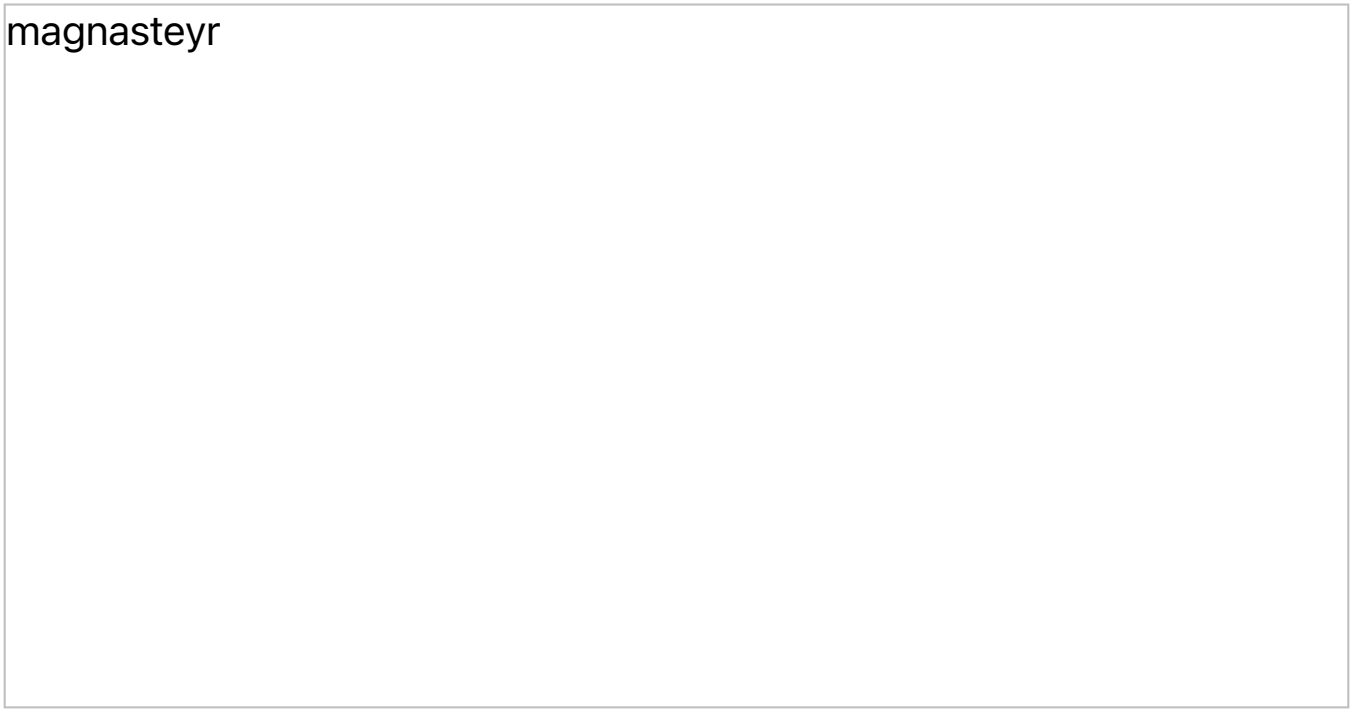
Just days after the vans were first spotted, an unidentified Apple employee emailed *Business Insider*, suggesting Apple was working on a project that would "give Tesla a run for its money." The source said that Tesla employees were "jumping ship" to work on a project at Apple that was "too exciting to pass up."

That tantalizing hint led several media sites to dig deep into Apple's plans, and in mid-February, *Financial Times* learned that Apple was recruiting automotive technology and vehicle design experts to work in a "top-

secret research lab." That piece highlighted Apple's hiring of former Mercedes-Benz Research and Development exec Johann Jungwirth and pointed out Apple's efforts to research automotive products.

Financial Times and other media sources initially speculated Apple was perhaps developing an advanced software platform to build upon CarPlay because a full-on car project sounded unbelievable, but just hours later, *The Wall Street Journal* launched a figurative bomb. Apple was indeed working on creating an electric vehicle, said the site, a project that it started exploring in 2014.

According to *The Wall Street Journal*'s sources, Apple had hundreds of employees working on designing a minivan-like electric vehicle under the code name "Project Titan." Steve Zadesky, Apple VP of Product Design was leading the project under Dan Riccio, and was given the go ahead by Apple CEO Tim Cook to recruit upwards of 1,000 employees, many from within Apple. Apple executives met with contract manufacturers of high-end cars like Magna Steyr, who Apple might have worked with had the car project not shifted focus.



A Magna Steyr conceptual vehicle from 2012

Apple's car team explored a wide range of technologies, including silent motorized doors, car interiors sans steering wheel or gas pedals, augmented reality displays, an improved LIDAR sensor that protrudes less from the top of a car, and spherical wheels, but there was no clear vision for the car and executives disagreed even on major points like whether the car should be autonomous or semiautonomous, leading to delays and internal strife.

As a result of the internal issues, in January of 2016, Steve Zadesky announced plans to exit the project, leaving questions as to who would take over following his departure. In July of 2016, former Apple exec Bob Mansfield, who had retired from Apple in 2012, returned to lead the electric vehicle team.

After Mansfield began heading up the project in the summer of 2016, Apple's car strategy allegedly shifted towards autonomous driving, and in August and September of 2016, Apple laid off dozens of employees who were working on the project following an internal "reboot," many who have gone on to join other autonomous driving startups.

Apple adjusted the project to focus more heavily on the "underlying technology" for autonomous vehicles rather than actually building an automobile, and while initial rumors suggested the company was still developing a car and was continuing to pursue partnerships, later information indicated work on an actual car has stopped for the time being.

Apple has been granted a permit from the California DMV to test self-driving vehicles on public roads, and its vehicles, Lexus SUVs with radar and sensor equipment, have been spotted out on the road already. Apple may also be have purchased a testing site in Arizona that it previously leased.

Apple is also working on a shuttle program designed to transport

employees between Apple's office in Silicon Valley. Apple is partnering with Volkswagen and will be installing its self-driving software in Volkswagen T6 Transporter vans to serve as an employee shuttle.

In August 2018, rumors suggested Apple could potentially be exploring the idea of a full Apple-branded vehicle once again. Reliable Apple analyst Ming-Chi Kuo said that Apple is working on an Apple Car that will launch between 2023 and 2025, despite rumors suggesting that Apple has ceased its work on an autonomous vehicle and is instead focusing on software.

Apple in January 2019 culled the Project Titan team once again and removed over 200 employees. In 2020, Bob Mansfield, who had been overseeing the project since 2016, retired and John Giannandrea took over the car project. Apple's Kevin Lynch is also working on the Apple Car team in addition to working on Apple Watch.

Doug Field, a former Tesla executive who was heading up the Apple Car project alongside John Giannandrea and Kevin Lynch, departed the company in September. It's unclear how this may affect Apple Car development, but it could be a major setback as he was the vice president of special projects. Lynch is taking over for Field, handling Apple Car development.

Apple in June 2019 purchased Drive.ai, a self-driving vehicle startup that designed a self-driving shuttle service. Apple hired multiple Drive.ai employees in the areas of engineering and product design for its own self-driving car project.

Apple held talks with electric vehicle company Canoo in early 2020, but talks ultimately did not move forward. Apple and Canoo discussed several options from an investment to an acquisition as part of Apple's efforts to further its electric vehicle project.

Canoo has developed a scalable, modular electric vehicle platform that drew Apple's interest. Canoo was hoping to secure an investment from Apple, but the talks deteriorated and ultimately, Canoo merged with Hennessy Capital Acquisition Corp. IV, raising $300 to finance the production of the Canoo minivan that it is developing. Canoo plans to create commercial electric vehicles like delivery vans, plus a consumer-focused van.

Apple Car Leadership

The Apple Car project has seen multiple leadership changes and hundreds of employees have been laid off during the course of development, but it is now under the leadership of John Giannandrea, Apple's AI and machine learning chief, who took over the reins from Bob Mansfield after Mansfield retired in 2020.

Kevin Lynch, known for leading development on the Apple Watch, has joined Apple's autonomous vehicle team to oversee Apple Car development in addition to working on the Apple Watch, so Apple has some of its top talent developing the vehicle. Lynch is replacing Doug Field, a former Tesla executive, who left the company in September 2021.

Recruitment Efforts

Apple started with team of about 200 employees working on the Apple Car, but was said to be aiming to have more than 1,000 employees. Since early 2015, Apple has been recruiting employees from the automotive industry and other car-related fields, such as researchers with specialties in battery technology and autonomous systems.

Over the years and through the changes to the Apple Car project, Apple has hired hundreds of high-profile employees with expertise in cars and autonomous systems, poaching from a wide range of car companies. Some employees on Apple's team have previously worked for major

companies like Tesla, Ford, and GM, while others have been recruited from smaller companies like Tesla, Volvo, Karma Automotive, Daimler, General Motors, A123 Systems, MIT Motorsports, Ogin, Autoliv, Concept Systems, General Dynamics, and tons more.

High-profile Apple hires from Tesla include former mechanical engineering manager David Nelson, former senior powertrain test engineer John Ireland, former Tesla head recruiter Lauren Ciminera, who may be working to recruit additional employees for the car project, and former Tesla vice president Chris Porritt, who may have joined Apple to play a key role in the development of the Apple Car. Porritt has decades of experience in the European automotive industry, having worked for companies like Land Rover and Aston Martin prior to joining Tesla.

Former Tesla senior CNC programmer David Masiukiewicz joined Apple in April 2016 to work in the Product Realization Lab, perhaps creating prototypes of parts designed for the Apple Car. Kevin Harvey, who previously worked in the CNC machine shop at Andretti Autosport, is also working in the lab.

Other notable hires include five employees from A123 Systems, a company that specializes in producing batteries for electric vehicles. Apple faced a lawsuit (now-settled) from A123 Systems over the poached employees, several of whom had expertise in lithium ion batteries designed for electric vehicles. The company's former CTO, Mujeeb Ijaz, is one of Apple's highest profile hires. Ijaz led a team responsible for research and development at A123 Systems, and prior to that, he worked at Ford as an electric and fuel cell vehicle engineering manager.

Apple has also recruited two former Ford engineers and an engineer that came from General Motors, and it has been poaching battery experts from Samsung. Other former Ford employees, with expertise in body work, include Todd Gray and Aindrea Campbell.

In mid-2015, Apple hired Doug Betts, who previously served as the Senior Vice President of the Chrysler Group, where he was the global head of operations leading product service and quality. Betts may be part of the operations team working on Apple's car project.

Apple hired several employees from electric motorcycle startup Mission Motors, reportedly leading to the company's shutdown. Apple recruited six engineers from the startup, whom are said to have electric drive expertise.

Apple has been hiring individuals with expertise in autonomous vehicles, such as Tesla Motors engineer Jamie Carlson, who worked on Tesla's autonomous vehicle firmware project, Paul Furgale, a researcher with specialization in autonomous vehicles, Jonathan Cohen, NVIDIA's former director of deep learning who worked on deep learning for NVIDIA's Drive NX platform, and Jaime Waydo, who formerly served as Waymo's head of systems engineering.

Apple has also hired Megan McClain, a former Volkswagen engineer, Vinay Palakkode, a graduate researcher at Carnegie Mellon University, Xianqiao Tong, who developed driver assistance systems for NVIDIA, Sanjai Massey, a Ford engineer who worked on connected and autonomous vehicles, Stefan Weber, a Bosch engineer who worked on driver assistance systems, and Lech Szumilas, a Delphi research scientist with former expertise in autonomous vehicles.

Other 2015 hires include Tesla Motors engineering manager Hal Ockerse, who worked on driver assistance system components; Subhagato Dutta, who worked on an automotive algorithm team at Texas Instruments; and Yakshu Madaan, who previously worked at Tata Motors, the largest Indian automotive manufacturer.

In the summer of 2016, Apple hired Dan Dodge, who formerly ran BlackBerry's automotive software division and developed QNX, the

software platform found in a wide range of in-car infotainment systems. Dodge's automotive software expertise suggests he is working on the team developing Apple's autonomous car system.

Apple has at least two dozen former BlackBerry QNX employees working on developing an in-car software platform at a facility in Kanata, Canada.

Popular YouTuber and engineer Mark Rober temporarily worked on Apple's special projects team developing VR technology that's designed to be used in self-driving cars both to mitigate motion sickness when doing activities like reading in the car, and for entertainment purposes.

Rober has been with Apple for a few years now and is listed on several related patents. The VR technology would specifically be used within autonomous vehicles that do not require a person to be driving.

Apple in August 2018 re-hired Doug Field, who spent five years working at Tesla where he oversaw production of the Model 3. Field served as Apple's VP of Mac Hardware Engineering until he left Apple for Tesla in 2013. Field left the Apple Car team in September 2021 and was replaced by Kevin Lynch.

Apple in July hired Steve MacManus, a former Tesla executive with expertise in car exteriors and interiors. MacManus now works as a "Senior Director" at Apple and could be working on Apple's car project. In 2020, Apple picked up Jonathan Sive, a BMW vehicle engineer who also worked at Tesla and Waymo, and Stuart Bowers, another former Tesla vice president who worked on Tesla's self-driving system.

Apple in 2019 hired former Tesla VP Michael Schwekutsch, who worked on motors and transmissions. Schwekutsch later left the company in late 2021 to join an air taxi startup. He had been working as a senior director of engineering on the special projects group, aka Apple's car team. Apple lost three other hires in the same timeframe, including chief engineer for

radar systems, Eric Rogers, engineering team battery manager Alex Clarabut, and hardware engineering manager Stephen Spiteri.

In December 2020, Apple hired Manfred Harrer, a Porsche executive with expertise in chassis design. Harrer was considered one of the best engineers in the Volkswagen Group, serving as the head of chassis development at Porsche prior to overseeing the Cayenne product line.

A former top Volkswagen manager told *Business Insider* that Mr. Harrer was a "hidden champion," and the "measure of all things in his field." Prior to working on chassis development at Porsche, Harrer worked for BMW and Audi.

Apple in June 2021 hired former BMW senior executive and self-driving vehicle startup founder Ulrich Kranz for its car project. Kranz founded Canoo, a self-driving car startup that he left earlier this year. Prior to creating Canoo, Kranz helped to develop the i3 and i8 vehicles at BMW, where he was employed for 30 years.

Apple in August 2021 hired two former Mercedes engineers to work on its special projects group to work on the Apple Car. One hire has expertise in the mass production of vehicles, vehicle steering, dynamics, and project management, while the other has similar expertise.

In May 2022, longtime Ford engineer Desi Ujkashevic joined the Apple Car team. Prior to departing Ford for Apple, Ujkashevic served as the Global Director of Ford's Automotive Safety Engineering Office. She had a hand in the development of the Ford Escape, Explorer, Fiesta and Focus, plus she worked on electric vehicles. Ujkashevic has a wealth of expertise that will benefit the Apple Car project, and she could be involved in helping Apple develop safeguards for electric vehicles.

Apple analyst Ming-Chi Kuo claimed in March 2022 that Apple's car team had been "dissolved for some time," and that it must be reorganized

within the next three to six months for mass production of the vehicle to begin by 2025, which is Apple's target production date.

Secret Headquarters

Several rumors about the Apple Car have included details suggesting Apple employees are working on the project at a top secret location in the Bay Area. Rumors and speculation suggest Apple's car campus might be located in Sunnyvale, California, just minutes from the company's main 1 Infinite Loop Campus in Cupertino.

Campus where Apple leases office space, via San Jose Mercury News

Apple officially leases several known buildings at the Sunnyvale location, but it is also said to be operating out of a shell company at the site, SixtyEight Research. SixtyEight Research claims to be a market research firm, but has received city permits for the construction of an "auto work area" and a "repair garage." It is not known if the rumors of the car project being housed in Sunnyvale are accurate, but based on past information,

development on the car (or car software) is indeed taking place at a secret location outside of the company's main campus. Apple has been snapping up a lot of real estate in the Sunnyvale area, including an industrial building that was once a Pepsi bottling plant.

Several of the buildings potentially associated with Apple's car project have secret internal names referencing Greek mythological characters like Zeus, Rhea, and Athena, all of which are tangentially related to "titans" in Greek mythology, perhaps hinting that the buildings are related to "Project Titan."

Building plans Apple filed with city officials suggest the company's Sunnyvale facility, codenamed "Rhea," is being used for something car related, with references to automotive terms like "lube bay," "wheel balancer," "tire changer," and "wheel sensor.

Apple is rumored to be operating a secret vehicle research and development lab in Berlin. The facility is said to employ between 15 and 20 men and women from the German automotive industry, all with backgrounds in engineering, software, hardware, and sales. The workers at the lab have all been described as "progressive thinkers" in their fields.

Apple in late 2018 leased a large manufacturing facility in Milpitas, California. It's not clear what Apple plans to use the site for, but it could potentially be related to the car project.

Apple's self-driving car program focuses heavily on safety, with Apple's vehicle protocols outlined in a white paper released by Apple. vehicle that's deploye is put through "rigorous verification testing" using simulation and closed-course proving grounds, and the test drivers operating the vehicles must complete multiple training courses. Apple also has safety protocols in place that require the driver to take over whenever necessary, and for the car to give control to the driver when it encounters situations it's unable to deal with.

Apple's Auto-Related Domains

In December of 2015, Apple registered three auto-related top-level domain names, including apple.car, apple.cars, and apple.auto. While the three domains could potentially be related to CarPlay, it's also possible Apple has saved the domains to be used in the future with an electric car or an autonomous car system.

Currently, the domains are not being used by Apple and do not contain any information.

Release Date

Reuters believes Apple is aiming to begin production on a car in 2024, but Apple analyst Ming-Chi Kuo believes it will be 2025 to 2027 at the earliest before an Apple Car is ready for launch. Kuo said he would not be surprised to see the launch schedule extended to 2028 or later.

According to *Bloomberg*'s Mark Gurman, work on the Apple Car is in the early stages, but Apple is aiming for a 2025 launch.