

# AUTONOMOUS CARSHARING/ TAXI PATHWAYS

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The introduction of autonomous vehicles could have notable impacts on the way people use carsharing and taxi services in the future. These vehicles could operate in a number of ways. For instance, they could drive up to carsharing users, self-park, and self-charge in the case of electric vehicles. Another option is that vehicles could self-drive users from their origins and destinations more like a taxi service. One vision for autonomous shared-use vehicles is that they provide first-and-last mile connectivity to public transit and fill service gaps in the transportation network in the future.

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## 2014 - CURRENT

Carsharing is generally defined as short-term vehicle access among a group of members who share a vehicle fleet that is maintained, managed, and insured by a third-party organization. It is typically provided through self-service vehicle access on a 24-hour basis for short-term trips. Rates include fuel, insurance, and maintenance. As of October 2012, carsharing was operating in 27 countries and five continents, with an estimated 1,787,000 members sharing over 43,600 vehicles. In July 2013, there were 24 carsharing operators in the U.S. with 995,926 members and 16,811 vehicles. Please note that these numbers reflect classic roundtrip and one-way carsharing only. Classic carsharing has been documented to take 9 to 13 vehicles off the road and reduce vehicle miles traveled by approximately 27 percent. (Shaheen Citations)

Recent real-time and app-based on-demand ride services, such as Uber, Lyft, and Sidecar, pair people through Internet and mobile platforms to facilitate dynamic on-demand rides and payment. These services, known as transportation network companies (TNCs) match drivers and passengers real-time through a smartphone app just minutes before the trip is to take place. The services also include a rating system for drivers and passengers and app-based payment. In contrast, taxis are vehicles for hire that are typically regulated with respect to license/entry, fares, and service quality. Traditional taxi services operate through passenger "hailing" or pre-arrangement of a ride. Most taxi services do not entail apps for real-time vehicle location or payment.



Image 1



Image 2



Image 3

## 2020

By 2020, it is estimated that several major car companies will have developed and released Level 3 automated vehicles. Level 3 is defined as partially automated vehicles where the driver can yield some control to the vehicle, but he/she will still be required to pay attention or take control in certain situations. While it is unclear whether or not this level of automation will significantly shift or alter current taxi or TNC operations, it is possible that this level of automation could impact the carsharing industry. With augmented safety features and limited self-driving ability, the inclusion of level 3 automated vehicles into a carsharing fleet could decrease an operator's overall insurance costs, which could translate to cost savings for users. This could also lead to increased user convenience (e.g., vehicles could self park and self charge).

Level 4 automated vehicles (fully self driving) that operate at lower speeds in specific rights-of-way, like the Navia (Left) and the Google car (Right), will likely become more widespread by the year 2020. These vehicles, although they are only capable of driving themselves in more controlled environments, will be able to provide the general public early exposure to fully automated vehicle technology and could be leveraged to provide first-and-last mile connectivity to public transit or ride services in closed campus settings (e.g., office complexes, retirement communities). The operations of these systems could help to establish future models for fully automated taxi-type services or carsharing fleets.

## 2030

By 2030, Level 4 automated vehicles will likely become more readily available in a commercial context. These vehicles would offer major benefits to taxi-type services and carsharing operators alike, as they would be able to autonomously reposition themselves to more efficiently and effectively meet a wider array of customers and their needs, they could refuel or charge themselves, and they could travel for cleaning and maintenance. Additionally, these vehicles in tandem with smartphone applications could also make ridesharing and carpooling easier, as vehicles would be able to locate and pick up additional passengers along their route who are looking to travel to the same or nearby destination.

The implementation of shared fully autonomous vehicles could cause taxis, TNC services, and carsharing to merge into a singular transportation mode.



Image 4



Image 5



Image 6



Image 7

Level 4 automated vehicles would allow members of carsharing services more convenient point-to-point mobility, similar to the current services offered by taxis and TNCs, as users would be able to get picked up and dropped off at their destinations rather than having to walk to and locate a vehicle, park, and return the vehicle. The carsharing user would also be driven by the vehicle in contrast to driving him or herself. A shared autonomous taxi fleet would be point-to-point, as they are today, with a limited range of vehicle alternatives offered to customers. Because these vehicles could operate without a human driver, labor costs could be largely eliminated, likely making a ride in an autonomous taxi service much cheaper than a comparable ride today. In addition to charging customers a fee per trip, autonomous carsharing services would likely have some form of membership fee that would provide members access to a wider variety of fully autonomous vehicles.

It is likely that the shift to fully autonomous shared vehicles would begin in more densely populated areas, where demand is initially highest, and then slowly spread to suburban, and perhaps, rural areas.

## 2050

By 2050, the increased production of fully autonomous vehicles will likely decrease the production and purchase costs of these vehicles, making them more affordable and attainable by the general public. Because private automobiles typically sit idle for a majority of their lifetime, owners of fully autonomous vehicles may be financially incentivized to make their cars available to the general public through peer-to-peer (P2P) carsharing services (privately owned vehicles employed in shared-use fleets) when they are not using them. As a result, the fleet of shared autonomous vehicles available to provide on-demand, point-to-point mobility could be greatly augmented. Since individuals rather than carsharing companies would capitalize from P2P carsharing services (by providing the vehicles), it is possible that shared autonomous vehicle services could more easily spread to suburban and rural areas (those typically with lower overall demand).

If a significant portion of society begins to switch to shared-use vehicle services, it becomes possible to significantly reduce the energy and environmental impacts of private vehicle travel. Depending on the adoption rate of fully autonomous shared-vehicles services, cities could repurpose large portions of existing parking structures to other types of developments, such as parks and housing.

## GLOSSARY

**Level 3** automated vehicles are defined as partially automated vehicles where the driver can yield some control to the vehicle, but he/she will still be required to pay attention or take control in certain situations.

**Level 4** automated vehicles are fully self-driven; the driver is not expected to take care of any control functions during the trip.

**Transportation Network Companies (or TNCs)** are a new category of transportation services that enable prearranged trips via mobile platforms (apps) and the Internet that connect riders and drivers, who drive their personal vehicles, as well as trip payment.

**Peer-to-peer (P2P) carsharing** employs privately owned vehicles made temporarily available for shared use by individuals or members of a P2P carsharing company. It allows short-term (hourly or daily) or longer-term (multi-day) vehicle access; members only pay for the time they use the auto and the mileage driven. Insurance is typically provided by the P2P carsharing organization during the access period.

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## PHOTO CREDITS

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Image 2 - Lyft – <http://wp.streetwise.co/wp-content/uploads/2013/12/Lyft.jpg>

Image 3 - Taxi - [http://www.sunshinetaxillc.com/yahoo\\_site\\_admin/assets/images/taxi.9485942.jpg](http://www.sunshinetaxillc.com/yahoo_site_admin/assets/images/taxi.9485942.jpg)

Image 4 - Navia - <http://www.telegraph.co.uk/motoring/green-motoring/10568824/First-driverless-car-on-sale.html>

Image 5 Google Car - <http://www.cnn.com/2014/05/28/tech/innovation/google-self-driving-car/>

Image 6 & 7 - Driverless car interiors  
- <http://www.dezeen.com/2014/02/21/driverless-car-concept-vehicle-xchange-by-rinspeed/>