

5G and Edge Computing Enhances Connected and Autonomous Experiences

AWS Wavelength enables new advanced safety and connected vehicle use cases

From connected vehicles using C-V2X (Cellular Vehicle to Everything) capabilities to make the driving experience safe to the eventual fully autonomous (level 5 autonomy framework from SAE International) vehicles, 5G and Edge computing infrastructure are playing a key role in accelerating innovation.

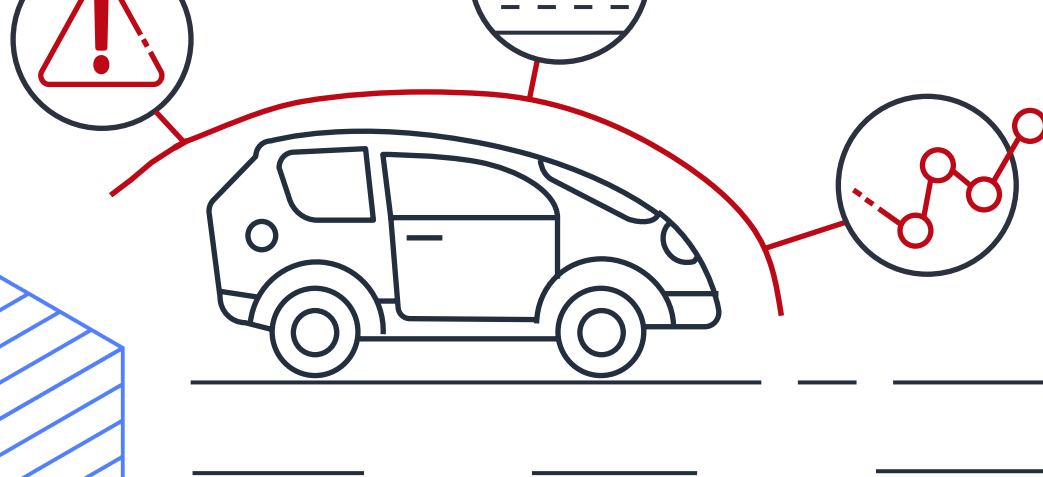
An evolving landscape



1 Connected Vehicles

2 Autonomous Driving and Safety

3 Sharing and Subscription



1 Connected Vehicles

- Upstream critical sensor and performance information
- Consume rich media and non-entertainment information during transit
- Software platform with over-the-air (OTA) upgrade capabilities



575 Mbps

Average 5G speed will be 575 megabits per second by 2023.¹

2023

In 2023, the automotive industry will become the largest market opportunity for 5G IoT solutions. It will represent 53% of the overall 5G IoT endpoint opportunity in that year.²

2 Autonomous Driving and Safety

- Improved safety and convenience features under the umbrella of advanced driver-assistance systems (ADAS)
- Real-time situational awareness with C-V2X
- Vulnerable road-user detection with AI and Edge computing



\$75 billion

The economic cost associated with US vehicle collisions in 2017.³



94%

Of all vehicle crashes are due to human error.⁴

3 Sharing and Subscription

- Ride-sharing and vehicle sharing mainstream
- Subscription services from Auto manufacturers
- Mobility-as-a-Service using autonomous driving capabilities



20%

Driverless vehicles will be 20% less expensive than traditional car ownership by 2027.⁵



\$170 billion

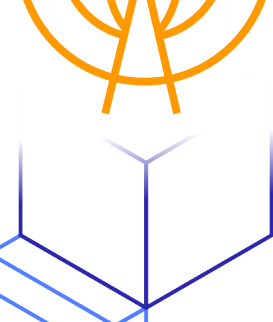
The potential market size for autonomous cars and 'robotaxis' by 2040, largely made up of MaaS services.⁶

How does AWS Wavelength help transform Connected and Autonomous Vehicles?

AWS Wavelength Zones bring the latest compute and storage technologies to the edge of the 5G networks so that they can be accessed with ultra-low latency from connected vehicles. Use AI and GPU acceleration on AWS Wavelength to offload onboard processors where possible.

Traffic between 5G devices and content or application servers hosted in Wavelength Zones do not traverse the internet, resulting in reduced variability and packet loss. Host critical information for safety and autonomous operations on AWS Wavelength.

Low-latency access to edge computing infrastructure enables hosting for safety and autonomous driving assistance applications on AWS Wavelength. Low latencies can also enhance the user infotainment experience, reducing wait times and allowing for responsive interaction.



New use cases enabled by 5G and Edge computing

1. Advanced Safety Features

- **Real-time situational awareness:** Local urgent events (like icy roads or mudslides) can be updated and relayed with minimal delay.
- **See-through operations:** Allow vehicles behind to understand what's happening ahead on the road, even if blocked by large trucks.
- **Pedestrian safety:** Users like pedestrians or cyclists up front can be detected via cameras, with AI inference assistance from the mobile edge.

2. Infotainment

- **In-car entertainment:** Keeping popular content on the mobile edge as part of a content delivery network (CDN) to allow fast access can improve the consumer experience.
- **High-definition maps:** Tiles or other localized information can be stored at the mobile edge, reducing the access time to pull high-definition content and allowing for high-interactivity with rich content.

3. Convenience and Comfort

- **Road conditions adjustment:** Real-time updates on road conditions to inform drivers about best lanes to stay in or update traction control systems.
- **Localized traffic analysis:** Improved routing to optimize traffic flow, avoiding slowdowns, or traffic jams.
- **Co-operative Lane Change:** For lane changing, vehicles can leverage the mobile edge to signal other nearby vehicles about their intention.

4. Security

- **Edge-hosted malware detection:** Protect against denial-of-service attacks both ways that attempt to compromise or overload the V2X infrastructure.
- **Authentication for C-V2X:** Ensure that only trusted entities are in communication over the network with authentication and authorization at mobile edge.

AWS Wavelength benefits for autonomous vehicles



Reliable and consistent network connectivity

Reduced number of network elements between the vehicle or mobile device and application servers reduce variability and packet loss and enable hosting of critical safety and autonomous driving functions in Wavelength Zones.

Lower latency for real-time responses

Reduced latency access to compute infrastructure enable real-time Vehicle-to-Vehicle, and Vehicle-to-Infrastructure and other safety and autonomous driving functions to be hosted on AWS Wavelength.

Drive innovation

Bring new services to market faster by using AWS services in Wavelength Zones to leverage benefits of improved network performance offered by 5G networks. Use AI/ML services and GPU acceleration to offload onboard processors. Provide richer applications without consuming more space, weight, or power on the vehicles.

Cloud elasticity

Scale your infrastructure up or down to meet demand or reduce costs. Shift workloads to AWS Regions seamlessly as needed. Process data at the edge to avoid backhauling vast amounts of data.

Consistent developer experience

Access familiar and powerful AWS services and developer tools. Enjoy the same benefits of AWS cloud like pay-as-you-go pricing and on-demand access. Application developers can re-use their development methodology, application monitoring constructs, and infrastructure.

AWS Wavelength brings the world's most comprehensive and broadly adopted cloud platform to global 5G networks.

To learn more about AWS Wavelength go to <https://aws.amazon.com/wavelength/>

1 IDC report, Worldwide Autonomous Vehicle Forecast, 2020-2024 (IDC #US46767820)

2 Gartner. <https://www.gartner.com/en/newsroom/press-releases/2019-10-17-gartner-predicts-outdoor-surveillance-cameras-will-be>

3 CDC. <https://www.cdc.gov/transportationsafety/costs/index.html>

4 NHTSA. <https://www.nhtsa.gov/technology-innovation/automated-vehicles>

5 ScienceDirect, Cost-based Analysis of Autonomous Mobility Services. <https://www.sciencedirect.com/science/article/pii/S0967070X17300811>

6 IDTechEx. <https://www.idtechex.com/en/research-report/autonomous-cars-and-robotaxis-2020-2040-players-technologies-and-market-forecast/701>