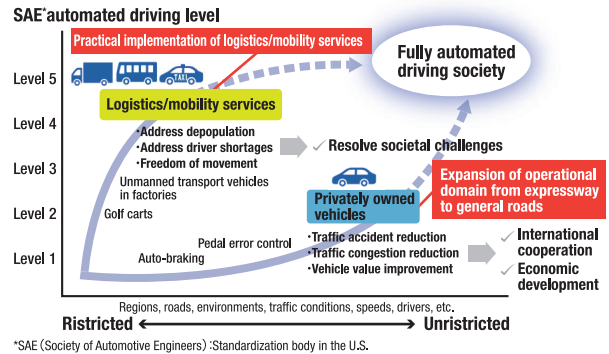




Automated Driving for Universal Services

For a society with the safest and smoothest mobility for all people

With the goal to create a society in which everyone can move safely and securely, and in order to contribute to solve social issues such as traffic accidents and traffic jams, maintaining transportation means in underpopulated areas, and a shortage of drivers in the logistics industry, we will promote “expansion of the practical application of automated driving from expressways to general roads,” and “realization of logistics/mobility services using automated driving technology”.



Program Director

KUZUMAKI Seigo

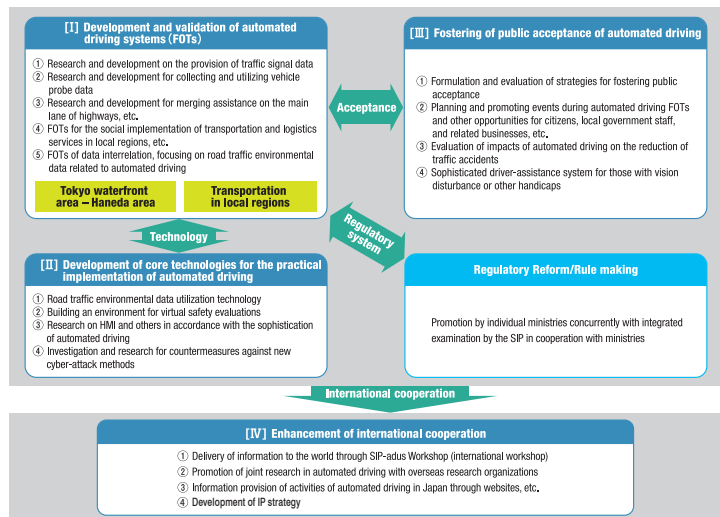
Toyota Motor Corporation
Advanced R&D and Engineering Company
Fellow

Profile

Mr. KUZUMAKI received a master's degree in aeronautical engineering from Kyoto University in 1985. The same year, he joined Toyota Motor Corporation in the Body Design Department. In 2003, he began working in technology planning and technical development as the vehicle safety function supervisor in the Vehicle Technology Development Department at Toyota. He has served in his present post since 2019.

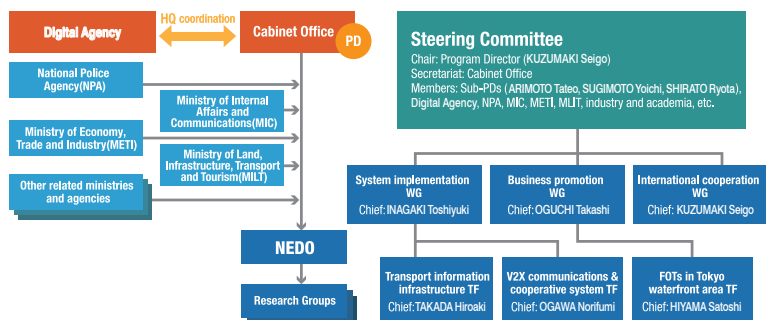
Research and Development Topics

For the implementation of automated driving systems, it is necessary to overcome three hurdles: technology, regulation, and public acceptance. The SIP will promote R&D on issues that should be addressed through cross-ministry and industry-academic-government collaboration. Specifically, focus will be on four pillars – development of core technology, including technology for provision of traffic environmental data to support automated and advanced driving and development of simulation tools for safety assurance, fostering public acceptance, enhancement of international cooperation, and planning/promotion of field operational tests(FOTs) that can contribute towards accelerating the resolution of issues and efforts, and promote preparation of the transport infrastructure. Through FOTs, information and demonstration will be provided to the public, international cooperation will be promoted through open discussions with participating overseas manufacturers. Additionally, the efforts of regulatory reform by relevant ministries will be synchronized with technology progress at the same time.



Implementation Structure

Under the Program Director (PD), the steering committee and three working groups (WGs) will determine the direction of and manage the R&D. The three task forces (TFs) consider more practical issues. Cross-ministry and industry-academic-government cooperation is essential for the provision of traffic signal data, road regulations, and other traffic environmental data. Cross-disciplinary efforts will be deepened for greater achievements and the government-industry-academia cooperation system will be expanded nationwide.



Exit Strategies

We aim at smooth implementation and commercialization of automated driving systems through stakeholder participated R&D based on the “Public-Private ITS Initiative/ Roadmap 2020” with the goal to realize a “society with the safest and smoothest roadway traffic in the world” by 2030.

- ✓ **Promotion of practical application and commercialization of automated driving, the priority themes of the second phase of SIP, including creation of the traffic environment data, safety evaluation technology in a virtual space and creation of a portal to promote sharing of the geographic data**

Establish technologies related to cooperative areas required for practical application of automated driving (such as construction of digital infrastructure, unification of data formats, establishment of simulation technology, and construction of data distribution frameworks).

- ✓ **Consideration for establishing an automated driving R&D center in Tokyo waterfront city area and promotion of practical application of mobility and logistics services in rural areas.**

Develop environment and structure that are necessary for traffic environment data, such as traffic signal information and traffic information at the lane level using vehicle probe data and vehicle probe data. Also, strengthen regional cooperation while promoting introduction and deployment of services by sorting issues related to vehicles, services, and environment maintenance through collaboration with regions and government bodies.

Past Milestones and Anticipated Outcomes

- With 29 institutions participating, FOTs in Tokyo waterfront area were carried out. Effectiveness of traffic environment data such as a high-precision 3D map on general public roads and signals that were associated with it, and data specifications to be used for automated driving were clarified.
- Toward wide deployment of automated driving, R&D of safety evaluation methods in a virtual space and countermeasures against new cyber-attacks are underway. Also, toward realization of Society 5.0, efforts have been made for the construction of search portals of geographic data.



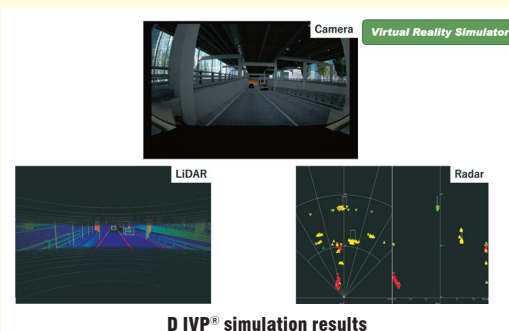
Vehicles participated in FOTs in Tokyo waterfront area

Creation and distribution of traffic environment data

- ✓ The effectiveness of traffic signal information provided by ITS Roadside Units was verified and requirements for data were clarified. Also, technical development is underway to generate and distribute traffic environment data such as traffic congestion tail information at the lane level using vehicle probe data. In 2021, the mechanism for distributing traffic environment data using long range communication (V2N) will be constructed and FOTs will be carried out under actual traffic environments in Tokyo waterfront area.

Creation of safety evaluation environment in a virtual space

- ✓ Efforts have been made for the development of simulation models that can be replaced with experiment evaluation in the real environment and are consistent with real images. And required sensor performance evaluation technology was defined. Based on such models, a safety evaluation environment DIVP® (Driving Intelligence Validation Platform) in a virtual space is under construction.
- ✓ In the future, efforts will be made for construction of databases around the Tokyo waterfront city area and a virtual evaluation environment will be created. While collecting feedback from automobile manufacturers and sensor suppliers, international cooperation and standardization utilizing a Japan-Germany partnership will be promoted.



D IVP® simulation results

Countermeasure technologies against new cyberattack techniques

- ✓ Because IDS (Intrusion Detection System) is effective toward unknown cyber-attacks against connected cars, we researched IDS performance evaluation methods aiming at establishment of an effective evaluation method. In the future, real communication data will be utilized, the method for evaluating IDS on a test bench equivalent to real cars will be established, and guidelines will be formulated.

Creation of the portal of traffic environment data to promote sharing of the geographic data

- ✓ To make geographic data available to diversified users to encourage new business, “MD communet™”, the search portal of the traffic environment data, that centrally aggregates data related to mobility was developed and published. In the future, while soliciting participating companies and bodies, we will establish a promotion system that can sustainably develop and operate.
- ✓ Use cases of data usage related to mobility were created. In addition, for the purpose of improving awareness of “MD communet™”, we conducted demonstration experiments in logistics and mobility areas, and held an application competition that would solve issues related to traffic in Kyoto, a tourist city.

