

Autopilot System Study meeting

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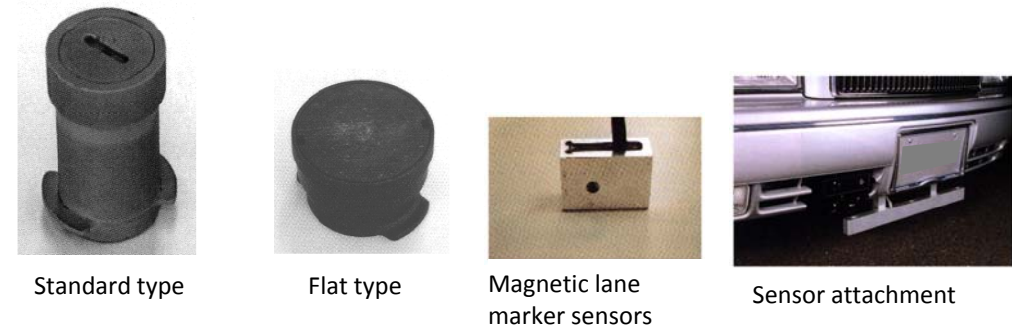
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1. Background of Study meeting (AHS)

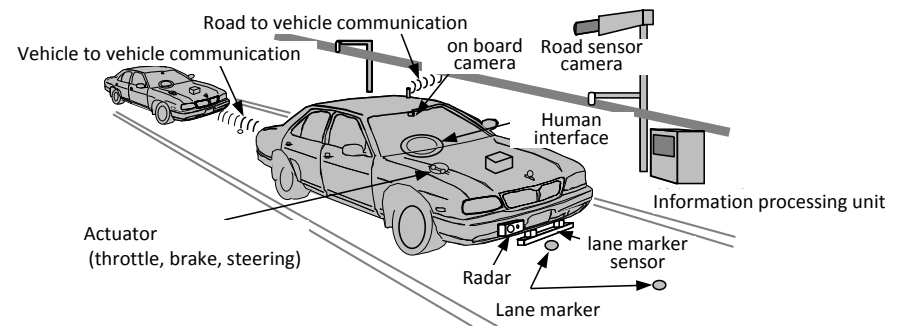
- The Advanced Cruise-Assist Highway System (AHS) is a system designed to provide information to the driver in real time through cooperation between the road and the vehicle, to increase the safety of vehicle driving, increase the quantity of goods that can be transported, and ultimately achieve automated driving.
- In 1994, the former Public Works Research Institute (now the National Institute for Land and Infrastructure Management) began development and experimentation aimed at achieving automated driving using AHS.
- In 1996, magnetic markers were embedded in the center of road lanes at two-meter intervals, and a convoy of 11 vehicles traveled continuously for approximately 11 kilometers in a demonstration of automated driving on public roads.



AHS: Demonstration test of cruise-assist drive



Magnetic Marker Magnetic Marker Sensors



Configuration of test sensors

1. Background of Study meeting

May 2011	Set Up Next-generation ITS Workshop (headed by Parliamentary Vice-Minister of MLIT)
May 2011 and thereafter	A total of five workshops held
March 26, 2012	Workshop summary report (released publicly)

Purpose of workshop and background of establishment, etc.

- The workshop was set up to conduct studies required to achieve automated driving on expressways.
- Interviews were held five times with key individuals in the area of ITS and advanced vehicle safety technologies.
- At the workshops, participants discussed technical trends, issues, etc., relating to the achievement of automated driving.

Major issues that must be resolved to achieve automated driving

- There are various possible patterns for the autopilot system that is required to achieve automated driving (the concept must be clarified).
- To achieve automated driving, issues must be resolved from the business, institutional, safety, societal demand standpoints, etc.

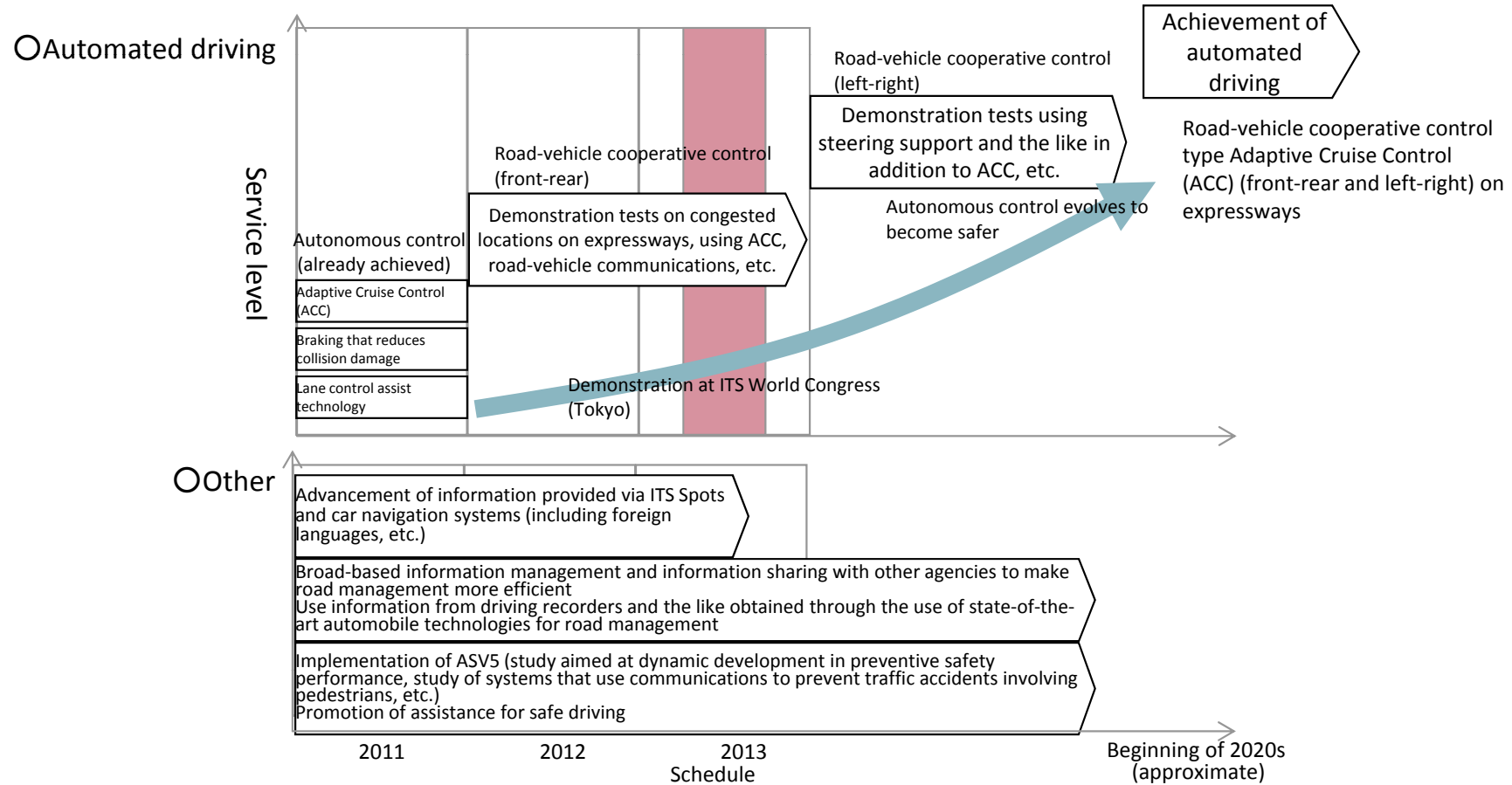


- Study meeting that includes key figures to work toward achieving the autopilot system

[Reference] Summary of Next-Generation ITS Workshop (excerpts)

- By 2013, road-vehicle and vehicle-vehicle cooperation technologies will be developed, and a road-vehicle and vehicle-vehicle cooperative driving support system with advanced Adaptive Cruise Control (ACC) will be studied and tested.
- Effectiveness in eliminating congestion on expressway will be demonstrated at the ITS World Congress in Tokyo, and the time when the autopilot system will be developed will be announced publicly.
- The goal is to achieve an autopilot system by the beginning of the 2020s.

Approach to achievement of next-generation ITS through public and private sector research and development (draft)



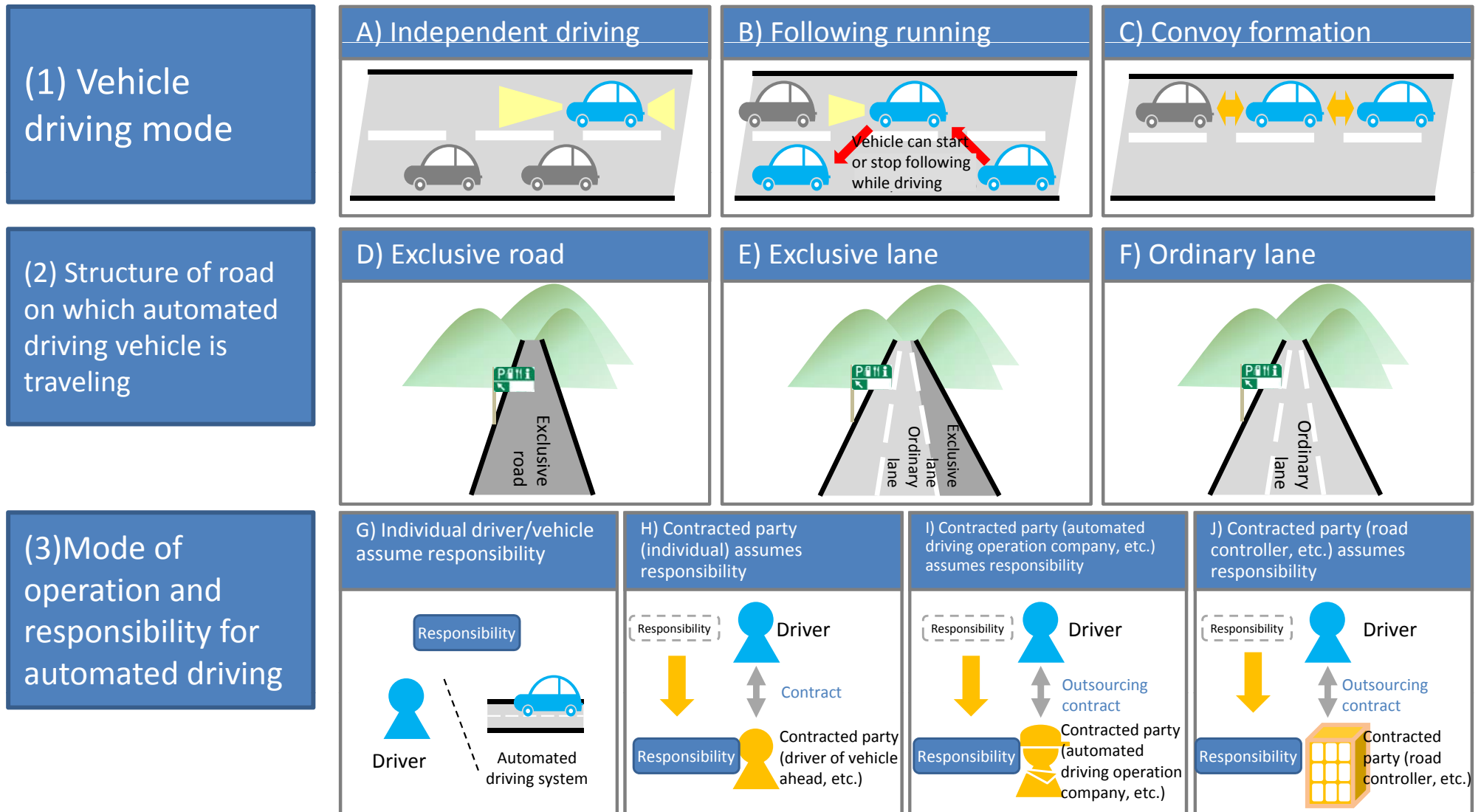
Adaptive Cruise Control (ACC): Vehicle control technology that maintains distance between one's vehicle and the vehicle ahead in terms of time, speed, etc.

2. Procedure Leading Up To Concept Selection (provisional) ((1)Setting of components)

- At the 1st Study meeting, in pursuit of defining the concept for the autopilot system, three components were established — (1) Vehicle driving mode (2) Structure of road on which automated driving vehicle is traveling (3) Mode of operation and responsibility for automated driving — and each component was classified and arranged.

Component

Combination of achievable classified components



2.Procedure Leading Up To Concept Selection ((2) selection of concept)

- Comparatively study the components. Realistically arrange the type of components that are determined, and consider the realistic combinations of these component types to establish draft concepts.
- Arrange detailed issues for each of the multiple draft concepts that have been established, and select concepts that have a high social impact and are achievable.

(1) Comparative organization of components

An overview of the issues involved with respect to each component will be compared and studied, and the types of components that are determined to be achievable will be selected.

(2) Establishment of draft concepts

Achievable combinations of the types of components organized in (1) will be considered, and establish draft concepts.

(3) Selection of concept

Specific issues relating to the draft concepts in (2) will be organized and selected.

Concept components

(1) Vehicle driving mode



3 types

(2) Structure of road on which automated driving vehicle is traveling



3 types

(3) Mode of operation and responsibility for automated driving



4 types

Total 36 types

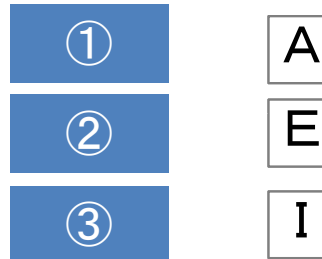
○: Achievable components (Example: 2 x 2 x 2 types)

Draft concepts

Draft concepts1

Draft concepts2

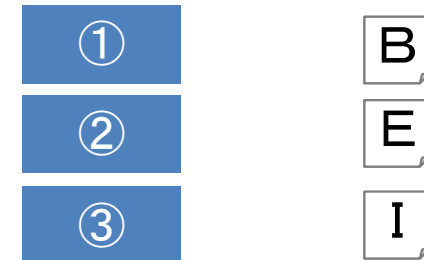
Draft concepts3



(3 - 4 types)

Concept selection

Concepts



3. Achievable Combination of Component Categories (provisional)

- Organize the combinations of component categories realistically and formulate a draft concept using these combinations.

Component

Combination of achievable classified components

(1) Vehicle driving mode

2 types

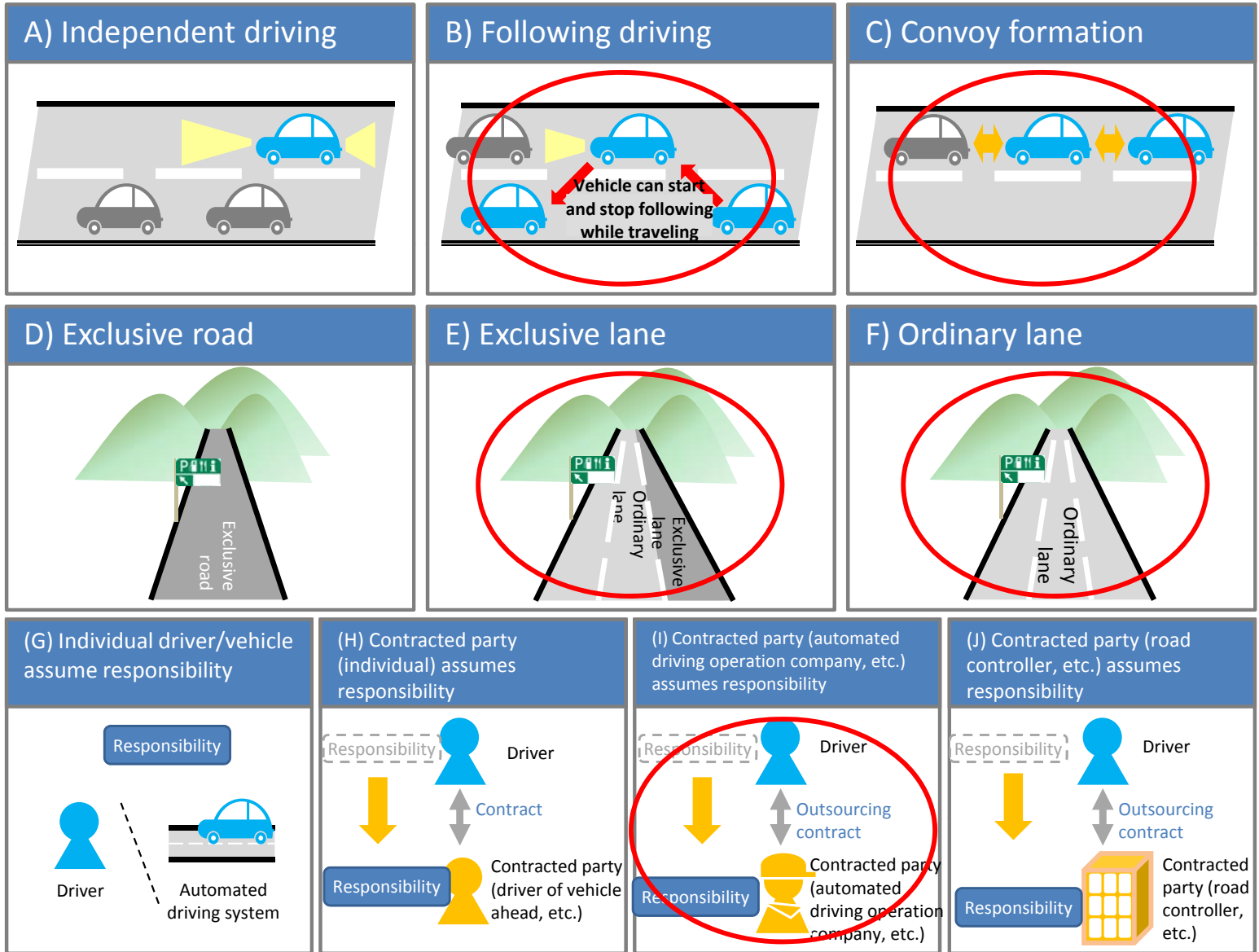
(2) Structure of road on which automated driving vehicle is traveling

2 types

(3) Mode of operation and responsibility for automated driving

1 type

(4 types)



4. Visual depiction of draft concepts

- The following four draft concepts were established through the combination of "Following driving" and "Convoy formation" in "(1) Vehicle driving mode," "Exclusive lanes" and "Ordinary lanes" in "(2) Structure of road on which automated driving vehicle is traveling," and "Contracted party (automated driving operation company, etc.) assumes responsibility" in "(3) Mode of operation and responsibility for automated driving."

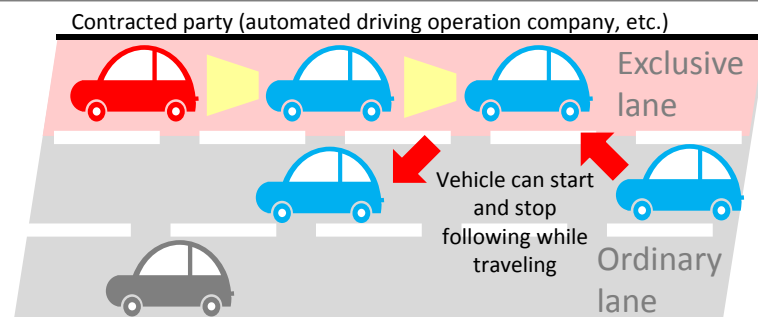
Exclusive lanes

Ordinary lanes

Following driving

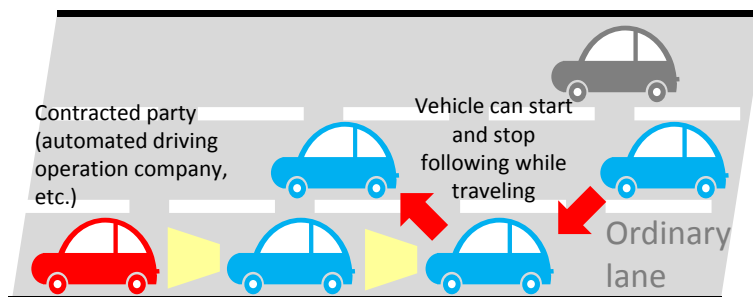
Draft concept 1

- In exclusive lanes, vehicles follow the vehicle being operated by the automated driving operation company, etc.



Draft concept 2

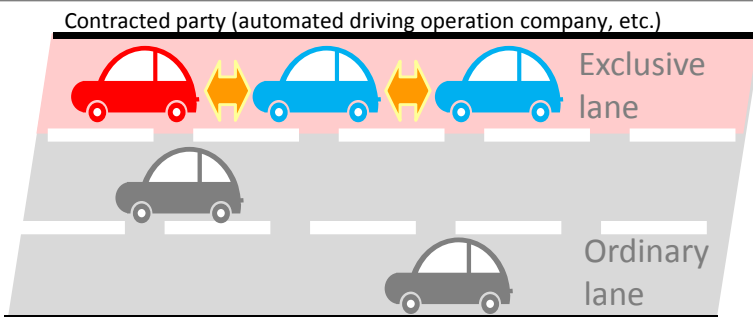
- In ordinary lanes, vehicles follow the vehicle being operated by the automated driving operation company, etc.



Convoy formation

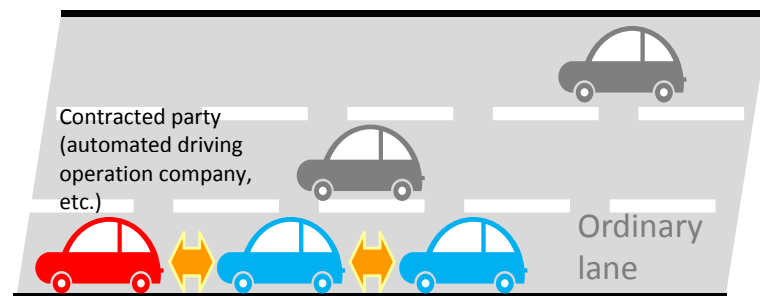
Draft Concept 3

- In exclusive lanes, the vehicle being operated by the automated driving operation company, etc., and multiple other vehicles form a convoy and travel together.



Draft Concept 4

- In ordinary lanes, the vehicle being operated by the automated driving operation company, etc., and multiple other vehicles form a convoy and travel together.



4. Visual depiction of draft concepts (visual depiction of ultimate goal)

- When studying the autopilot system, establish a draft concept keeping the ultimate goal in mind.
- To this end, establish the following image as representing the ultimate goal to be achieved, and conduct ongoing study.

Visual depiction of ultimate goal (draft concept 5)

- Vehicles will travel independently in ordinary lanes.
- The vehicle itself will detect the movement of surrounding vehicles, road status, the presence of obstacles, etc.

