MIC's Initiatives for Automated Driving Society

ITS Promotion Office
Telecommunications Bureau,
Ministry of Internal Affairs and Communications (MIC)
JAPAN

Evolution of Intelligent Transport Systems (ITS)

Advanced Driver Assistance

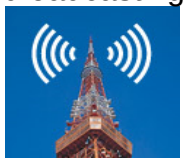
Information Provision Toll Collection

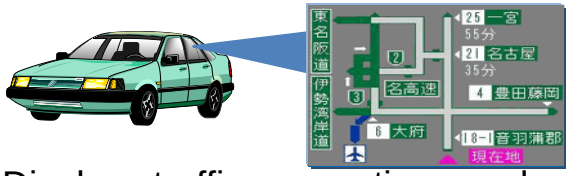
Highway radio

VICS*

Optical beacon | Radio beacon | FM multiplex broadcasting







Displays traffic congestion, road closures, etc.

ETC

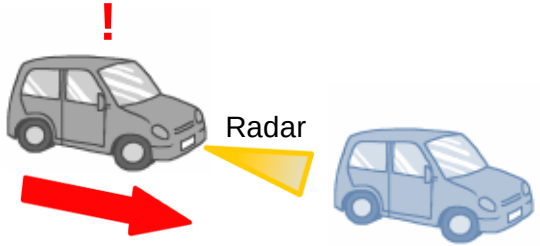
Electric toll collection

*Vehicle Information and Communication System

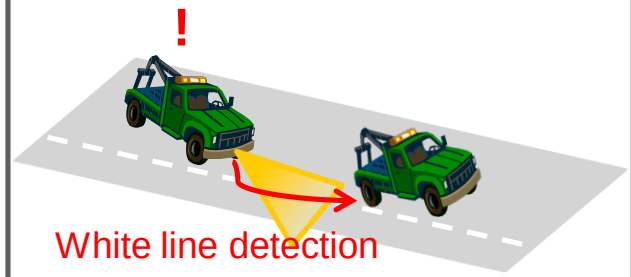
Autonomous

On-Board Sensors

The system uses on-board sensors such as cameras and radars to provide advanced driving assistance.



Autonomous Emergency Braking



Lane Departure Prevention System

Cooperative

V2X Communication

Advanced driving assistance by combination of V2X

Connected Car

Automated Driving Systems

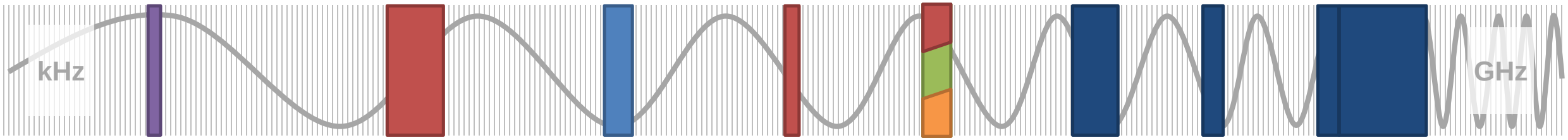
Frequency Allocation for ITS in Japan

Roadside Broadcasting (Highway radio) — 1620 kHz

Vehicle Information and Communication System (VICS) — 76 - 90 MHz; 2.5 GHz; 5770 - 5850 MHz

60 / 76 GHz Band Long-Distance Radar — 60 - 61 GHz; 76 - 77 GHz

79 GHz Band High-Resolution Radar — 77 - 81 GHz



700 MHz Band ITS System (ITS Connect) — 755.5 - 764.5 MHz

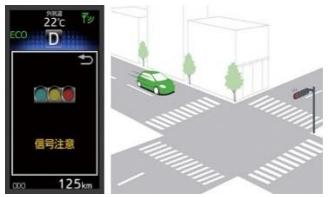
Electric Toll Collection System (ETC) — 5770 - 5850 MHz

ETC 2.0 / ITS Spot (ETC + Driving Support System) — 5770 - 5850 MHz

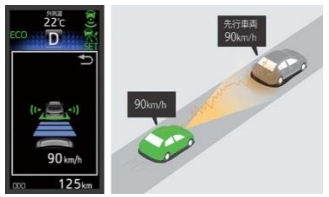
24 / 26 GHz Band UWB Radar — 22 - 29 GHz

The First V2X Communication System Commercialized in the World!

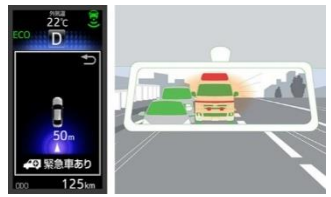
Early warning for safety



Provide traffic signal information

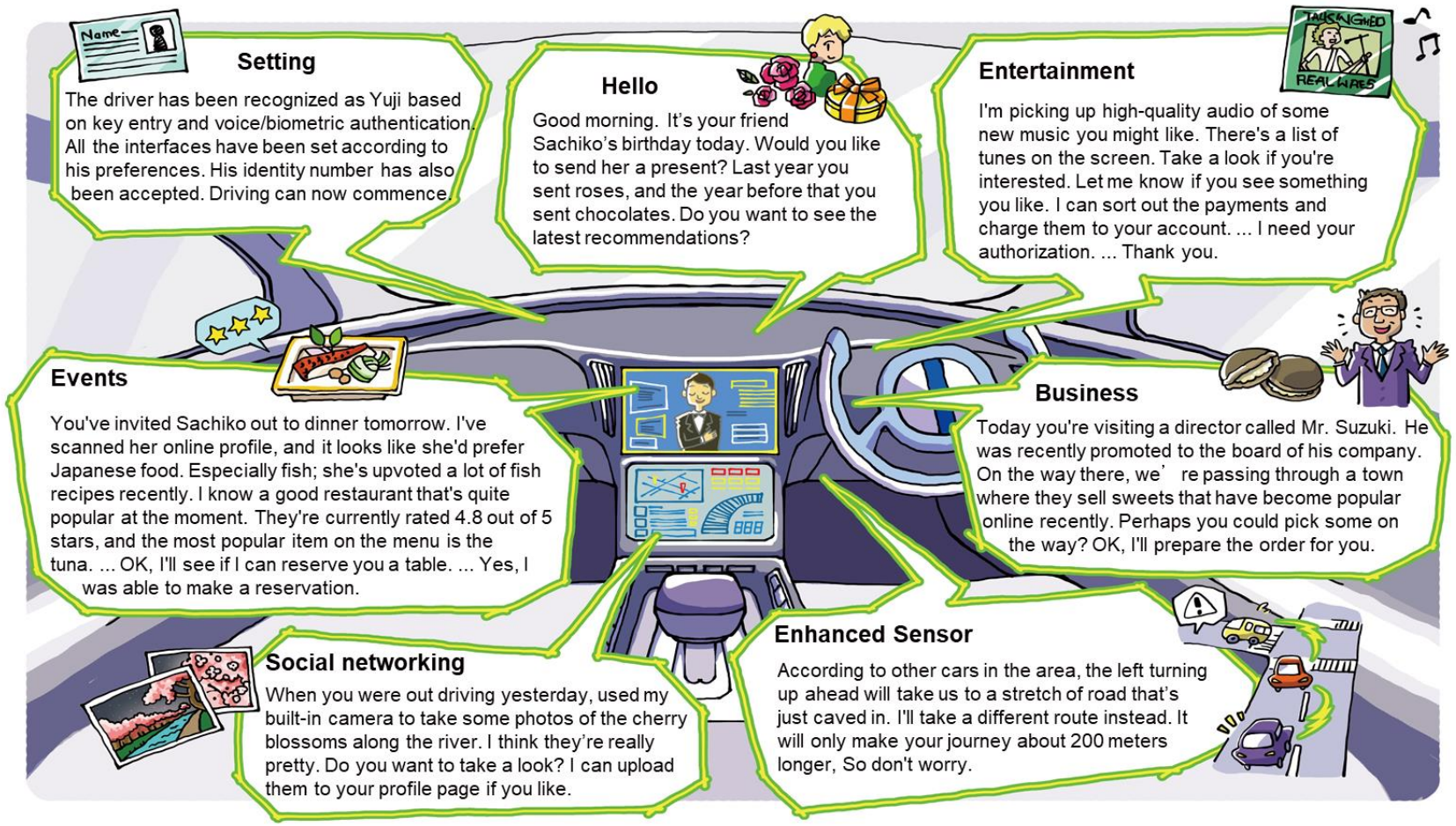


Corporative adaptive cruise control



Notify the approaching ambulance

Concept images: Connected Car



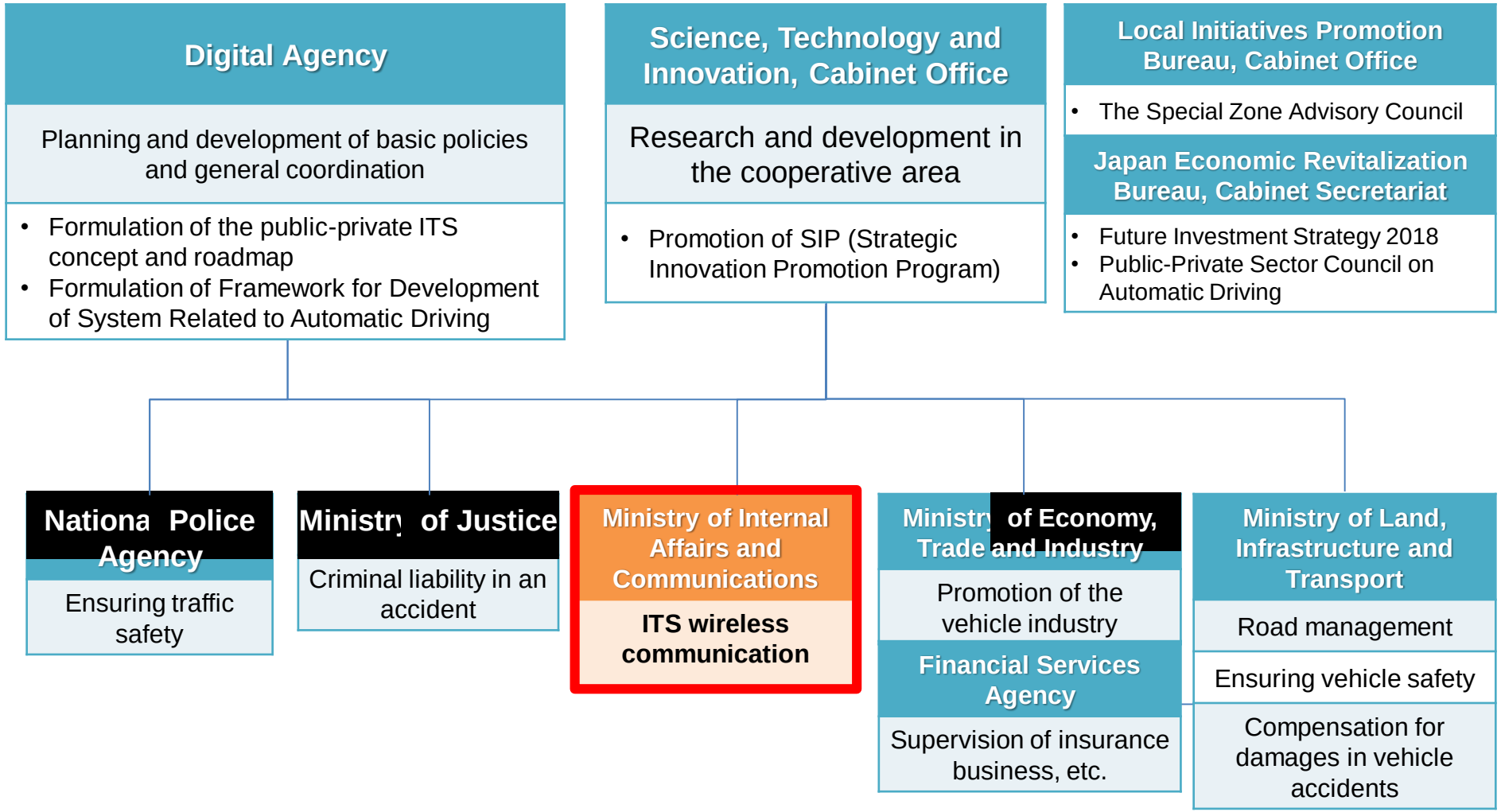
New mobility experience provided by Connected car

Shared vision of the vehicle in front

Ref.: Valeo S.A.'s XtraVue

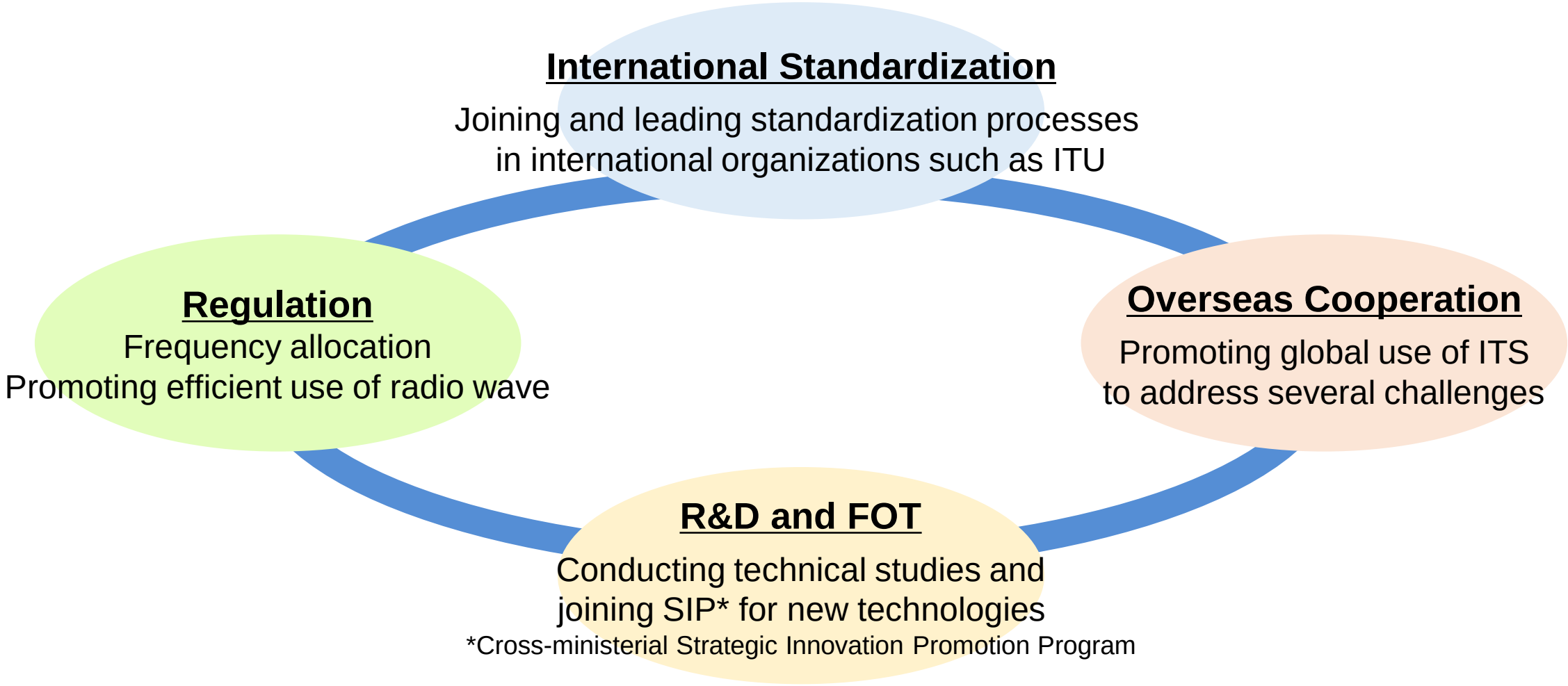
Promotion ITS in Japanese government

The ministries and agencies are working together to promote ITS to realize advanced self-driving.

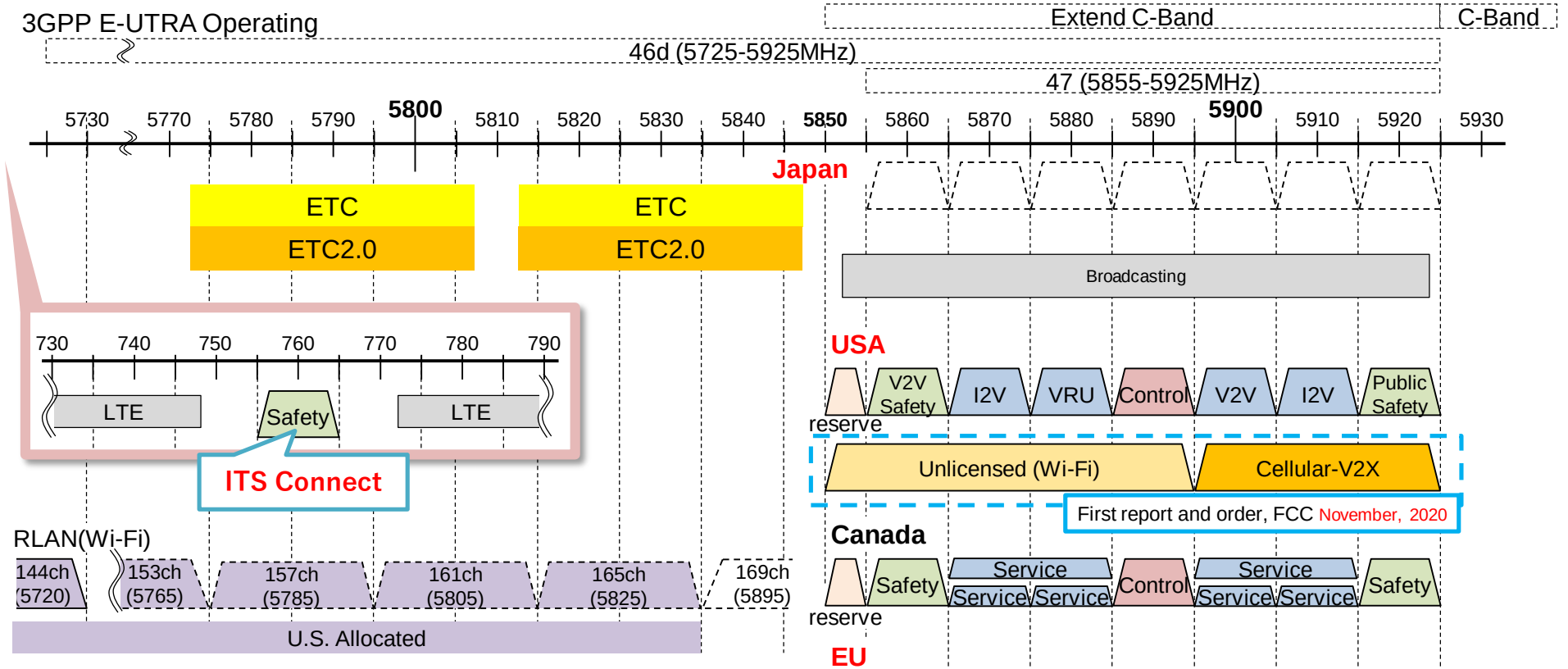


MIC's role

Ministry of Internal Affairs and Communications(MIC) promotes ITS wireless communication in coordination with the other ministries and agencies.



The global trends of frequency allocation for V2X



The discussions about the V2X systems in the 5.9 GHz band are heating up all around the world.

- China has decided introducing the V2X system (C-V2X) in 2018. The processes toward implementation such as FOT are ongoing.
- In the US, the Federal Communications Commission (FCC) conducted public comments on the proposition of revised frequency allocation for the implementation of the V2X system (C-V2X) in December, 2019. Based on the result, the FCC released new frequency allocation in November, 2020.
- In EU, European Commission decided that the member states shall designate 5875-5925 MHz band for ITS by the end of June, 2021.

Chapter 3 Priority Initiatives Ⅲ Initiatives for a Self-Driving Society

Based on the progress and importance of automatic driving systems (including safe driving support), a study is being carried out, **which will finish by the end of FY 2021, into the technical conditions for frequency sharing with needed existing wireless systems, for example when introducing V2X communications, and with consideration for existing wireless systems on frequency bands being studied internationally (5.9 GHz band)**, in addition to the existing ITS frequency bands (760 MHz band, etc.).

In addition, based on the results of these studies, **a conclusion will be reached within FY 2022 regarding frequency allocation policy, such as frequency sharing and migration/reorganization when introducing V2X communications in the same frequency band, etc.**

Chapter 4 Reorganization Policy for Each Frequency Range Ⅶ 5.85～23.6GHz Band

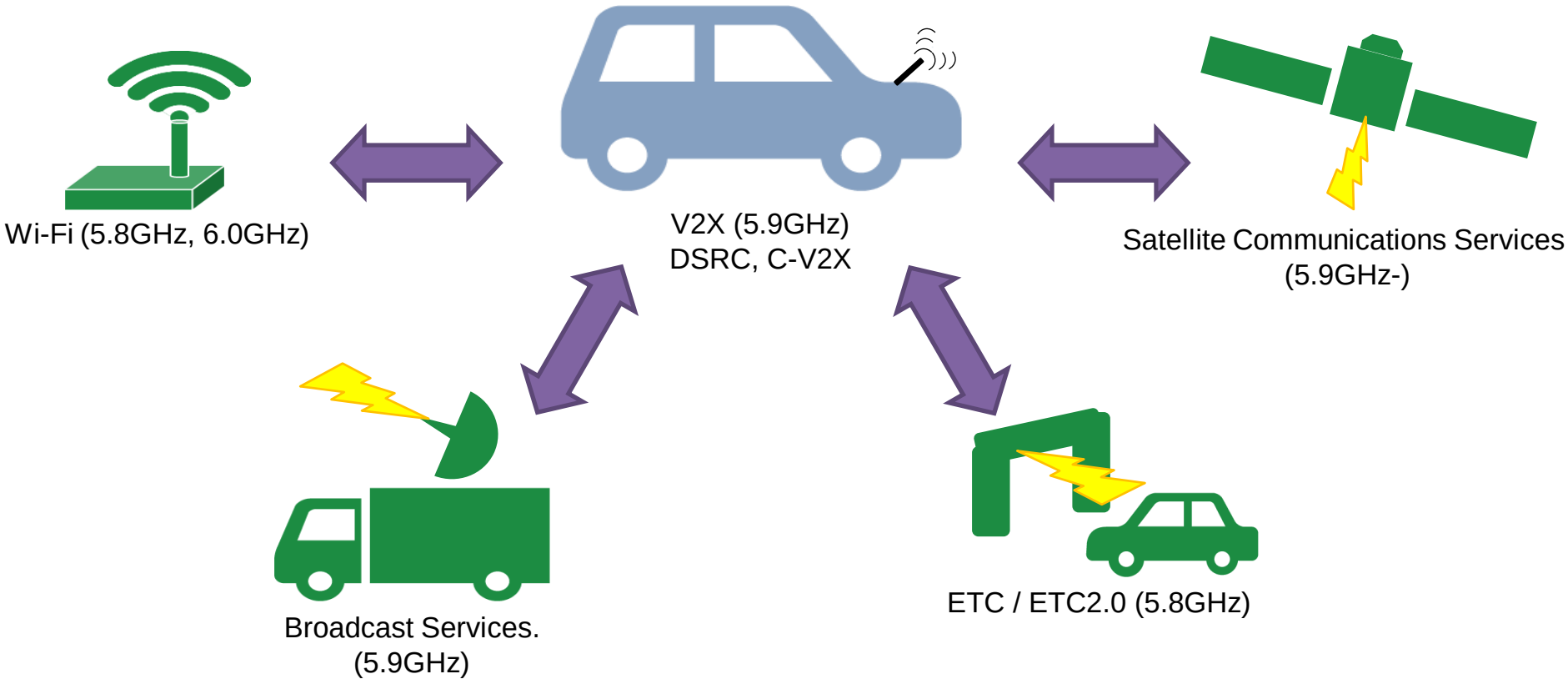
5. Commercial Broadcasting Radio Stations and Fixed-Satellite Services［5.9GHz band］

Based on the progress and importance of automatic driving systems (including safe driving support), a study is being carried out, which **will finish by the end of FY 2021, into the technical conditions for frequency sharing with needed existing wireless systems, for example when introducing V2X communications,** and with consideration for existing wireless systems on frequency bands being studied internationally (5.9 GHz band), in addition to the existing ITS frequency bands (760 MHz band, etc.,).

In addition, based on the results of these studies, **in cases where V2X communications are to be introduced on the same frequency band, there is a goal to allocate frequencies to V2X in FY 2023 after the necessary frequency bandwidth has been secured by migrating existing wireless systems, etc.**

MIC has been conducting technical study for the introduction of the V2X system in the 5.9 GHz band.

A technical study is conducted on the possibility of sharing with existing radio systems.



Technical study of V2X communication for self-driving (SIP: FY2020 - 2022)

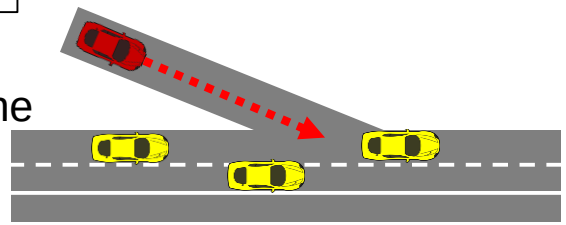
SIP: Cross-ministerial **S**trategic **I**nnovation Promotion **P**rogram

- In order to define the technical requirements of V2X communication, MIC conducted a technical survey and developed 25 use cases in FY2020.
- MIC are making a draft roadmap of communication requirements, with consideration of the technical study and the future usage rate of self-driving vehicle.

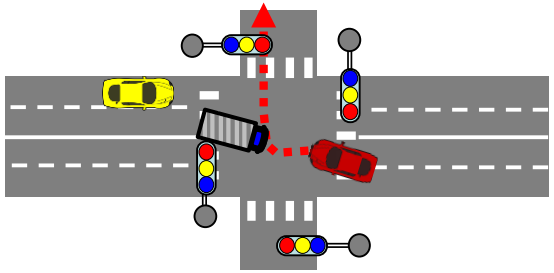
Example of Use Case

25 use cases

Joining the main lane on the highway

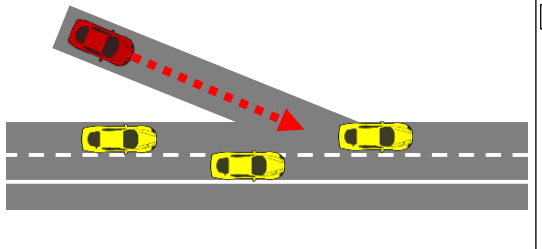


Turning right



→Define requirements for V2X in 700 MHz and 5.9 GHz band

Example of a roadmap



The stage of spread of self-driving cars			20XX Introduction	20XX Growth	20XX Maturity	
			Speed adjustment	Providing the information of the gap on the main lane	Adjustment the gap between the cars on the main lane	Arbitration among self-driving cars
Technical Requirement	V2V / V2I		V2I	V2I		
	Message / Size		Estimated time of merging lanes	Estimated time of merging lanes		
			Average speed on the highway	Average speed on the highway		
Communication Requirement	Delay		XX ms			
	Amount of data		XX bps			
	Consecutive emission		X times / 100 ms			
	Packet arrival rate		XX %			
	Distance		XX m			
Communication Method	Short Range	ARIB STD-T75				
		ARIB STD-T109				
	Long Range	LTE				
		5G				
	Frequency		XX	XX		
	Band		YY	YY		

→Technically evaluate the possibility of introducing V2X in 5.9 GHz band

R&D of small-scale and mid-scale NW information usage (SIP: FY2020 - 2021)

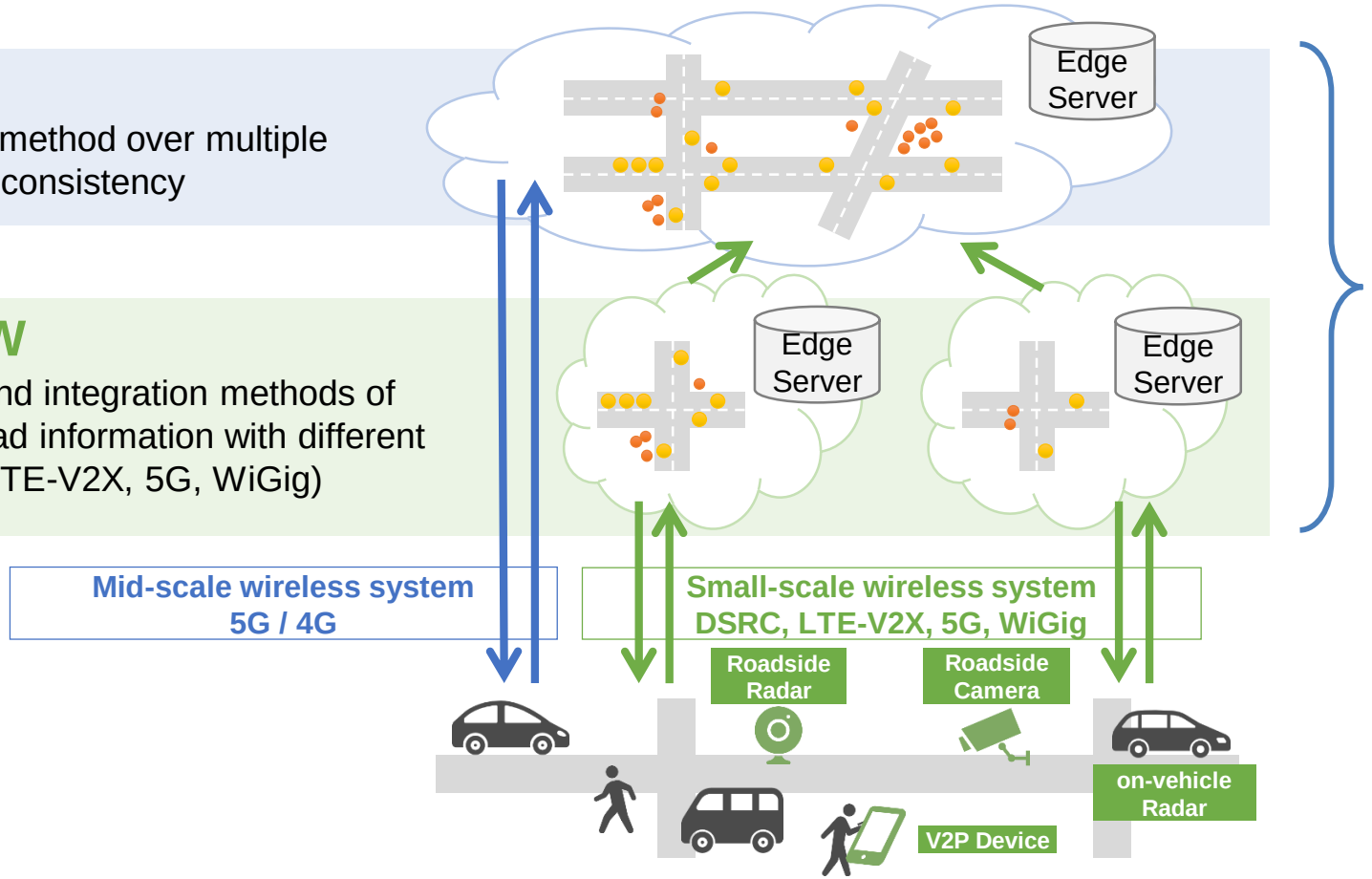
MIC has been carrying out a R&D project to develop an optimized method of collecting and providing the dynamic information about traffic environment from small/mid-scale areas.

Mid-scale NW

Optimization of distribution method over multiple Small-scale NWs with high consistency

Small-scale NW

Optimization of collection and integration methods of sensor data for dynamic road information with different wireless systems (DSRC, LTE-V2X, 5G, WiGig)



Compiling generated data from several sources, analyzing and optimizing the data depending on the situation, and delivering it to automated vehicles.

Overseas Cooperation: 700 MHz Band V2X in Asia-Pacific region (FY2020 -)

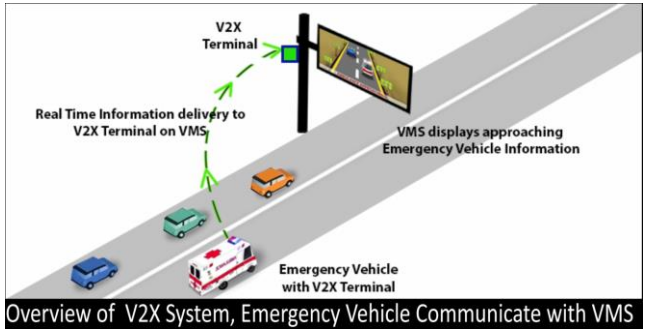
Providing ambulance-approaching-information to drivers (FOT in India in FY2021, FY2022)

OBJECTIVE

Solve the problem that ambulances cannot arrive on time due to traffic jam.

ABSTRACT

When an ambulance approaches the RSU (Road Side Unit), RSU displays ambulance-approaching-information for drivers. Therefore, drivers can give way to the ambulance beforehand, which makes ambulance reach the destination earlier.



Overview of V2X System for EV & VMS

Trial in Ahmedabad, Gujarat, INDIA

Driving safety support with RFID tag (FOT in Philippine in FY2021)

OBJECTIVE

Reduce a head-on collision, especially between motorcycles and cars at the intersection by supporting the recognition of non line of sight (NLOS).

ABSTRACT

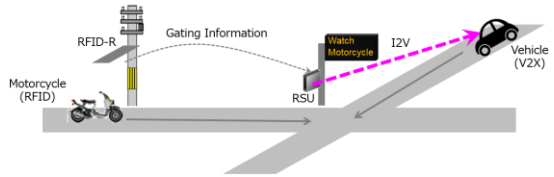
Using Passive RFID or Sensor

RSU collects motorcycles' positions and speeds from RFID or with sensor, and sends it to vehicles via I2V, or display it on RSU Monitor.

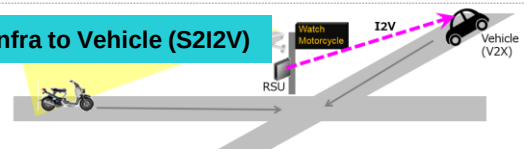
Using Active RFID

The vehicle near a motorcycle collects their positions and speeds, and sends the information to other vehicles via V2V.

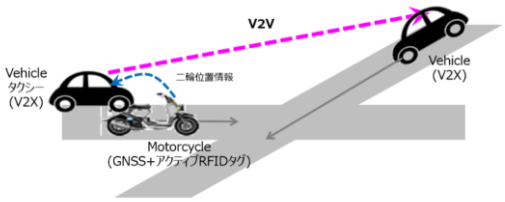
RFID reader to Infra to Vehicle (M2I2V)



Sensor to Infra to Vehicle (S2I2V)



RFID (active) to Infra to Vehicle (M2I2V)



Thank you for your attention