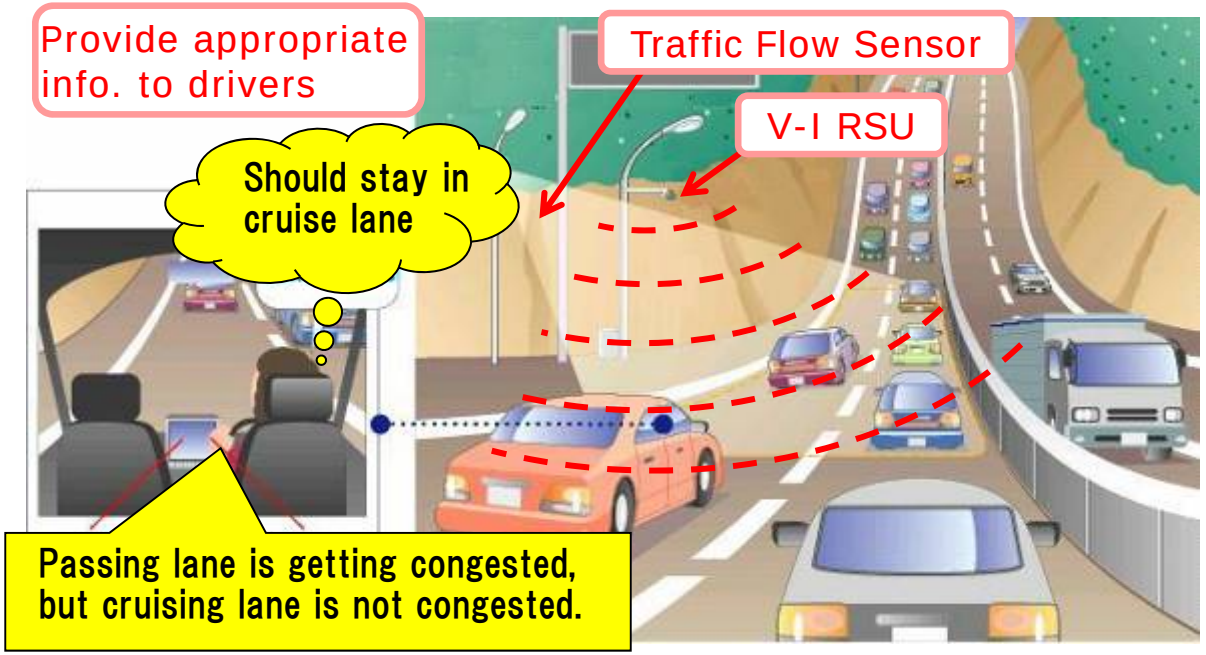
NISSAN MOTOR CORPORATION

Reducing Traffic Jams Utilizing ITS

1)Test to Reduce Traffic Jams

- To prevent traffic jams at sag, inform drivers of appropriate driving speed and driving lane
- Collect traffic data from Road Side Unit (RSU) and automatically set speed and distance from vehicle ahead with Adaptive Cruise Control (ACC).
- Develop smart car by increasing ACC speed.

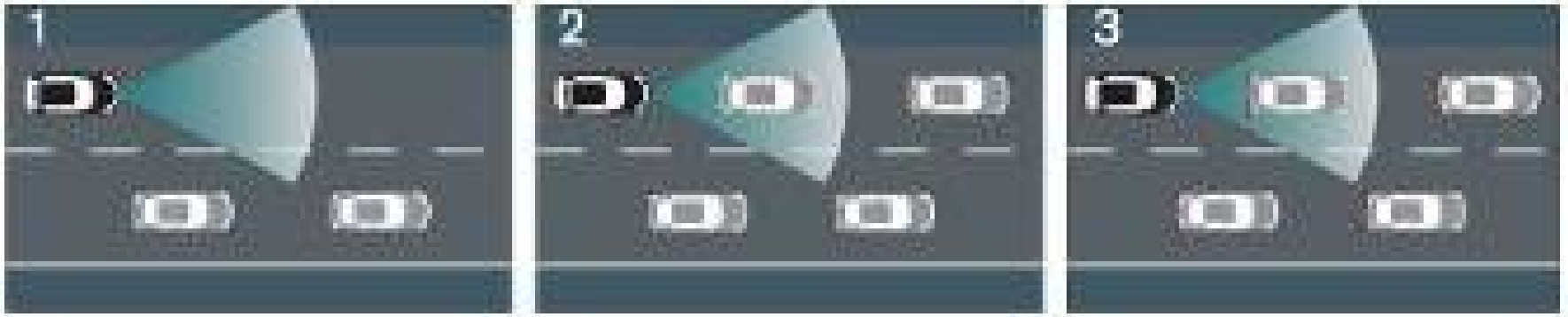


60% of traffic jams in expressway occurred in sag or tunnel

*Cooperative project with five vehicle companies, including Nissan, METI, etc.

1)Test to Reduce Traffic Jams –ACC-

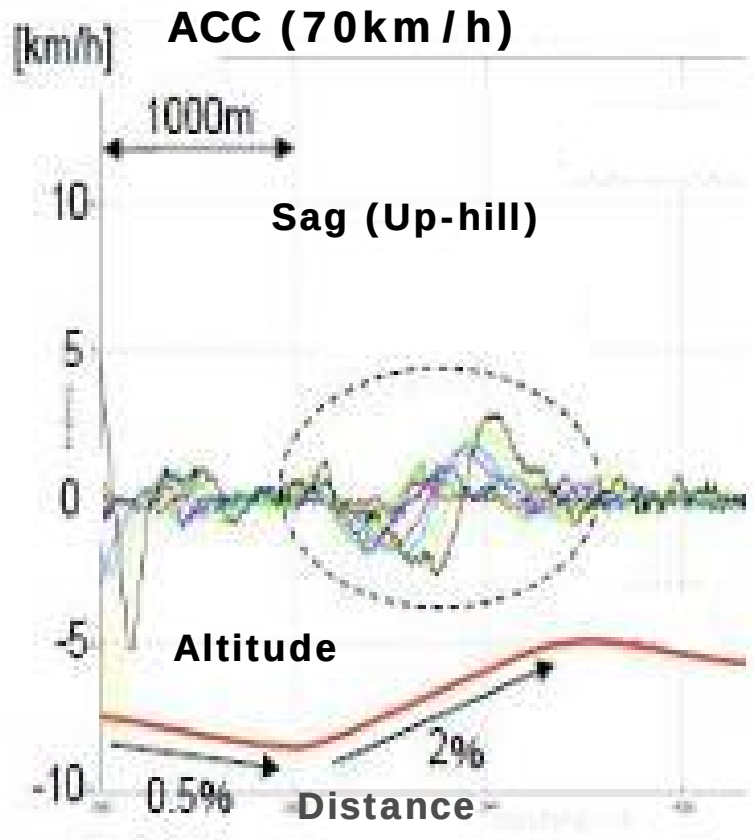
- Inter-vehicular distance automatic control system, or Intelligent cruise control system, keeps distance from vehicle ahead at the speed set in advance, or maintains the appropriate speed in case there is no vehicle ahead, collecting information from a sensor installed at the front-side of vehicle.

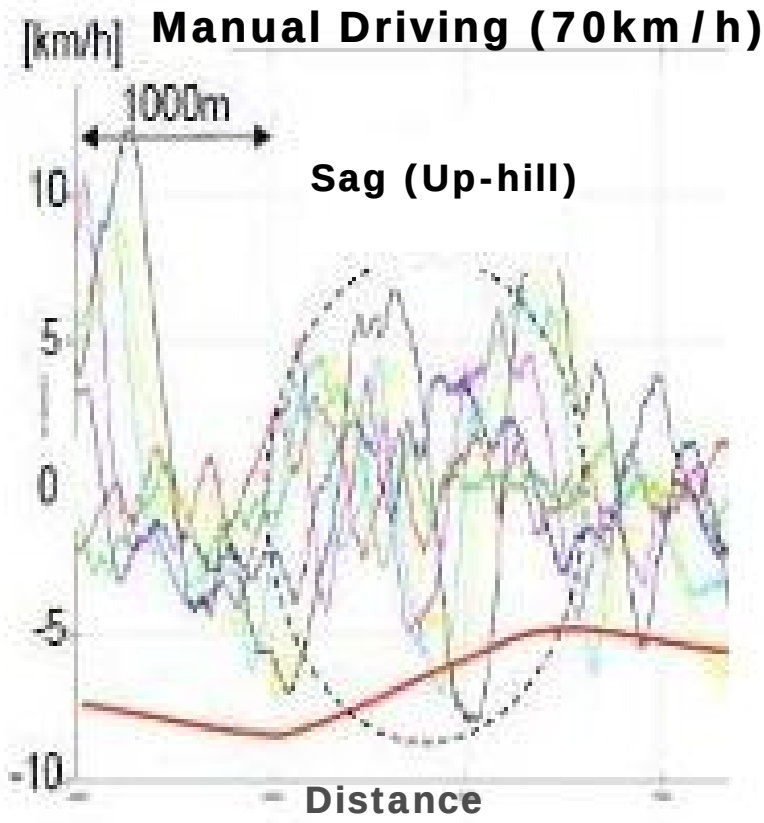


http://www.nissan-global.com/JP/TECHNOLOGY/OVERVIEW/icc.html

1) Effectiveness of ACC

- ACC enables more stable driving in case of less speed volatility of vehicle ahead than manually driven car.

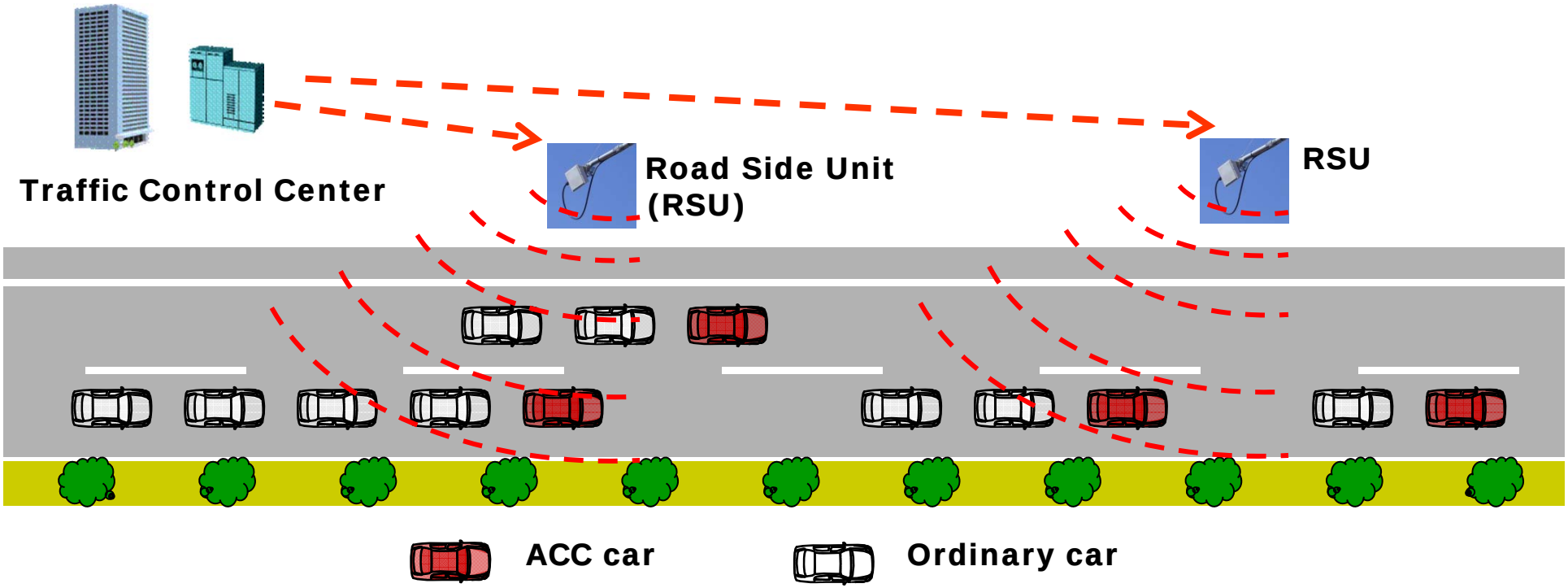




Test results of driving in a row with ACC vehicle

1)Harmonization of road and ACC

- Road operation center shares recommended speed and time between vehicles to ACC-equipped vehicle.
- Then ACC vehicles lead others at the recommended speed and control distance.



2) ITS Spots Service

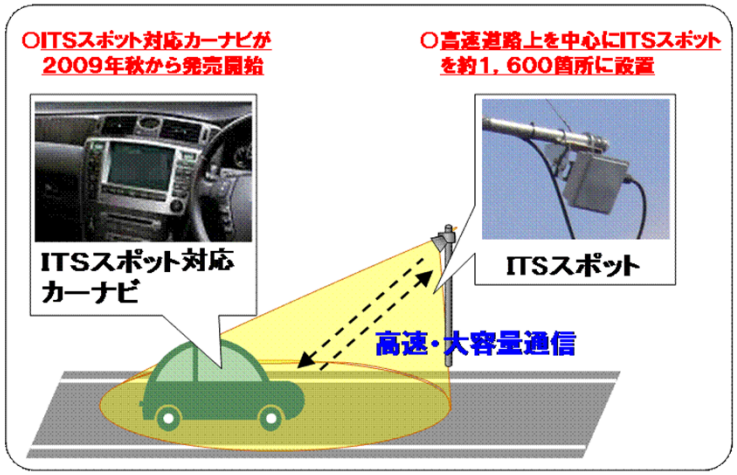
Launched in 2011

- Road to vehicle communication using ITS spots on highway

Car Navigation

+

ITS Spot Unit



＜Three basic services＞

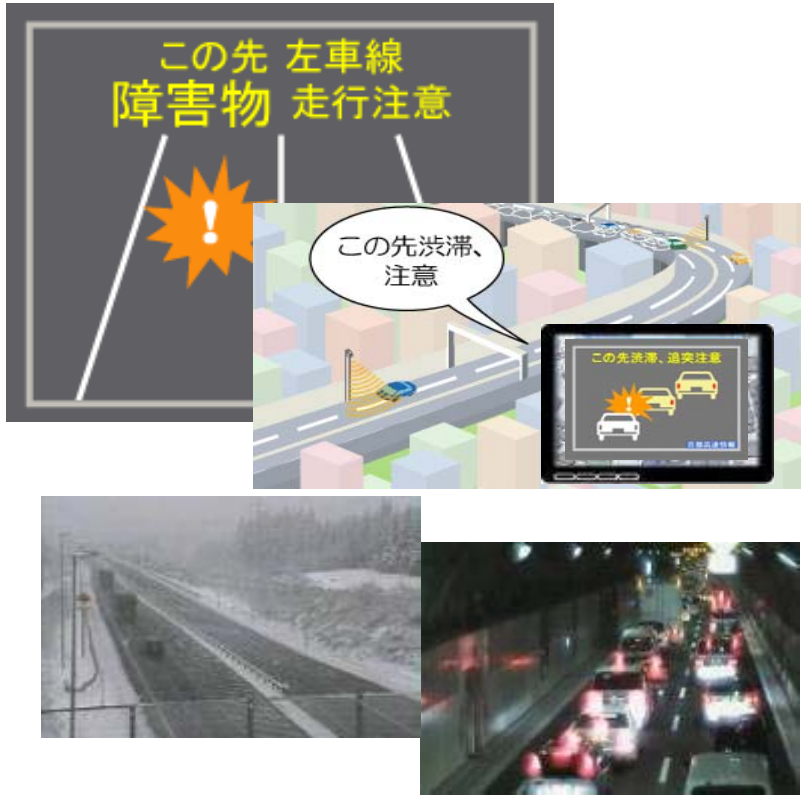
-Dynamic Route Guidance System (DRGS)：Obtain traffic data and select quickest routes through car navigation.

-Safety drive support：Avoid accident by alerting drivers of falling objects, for example.

-ETC：Deliver ETC service.

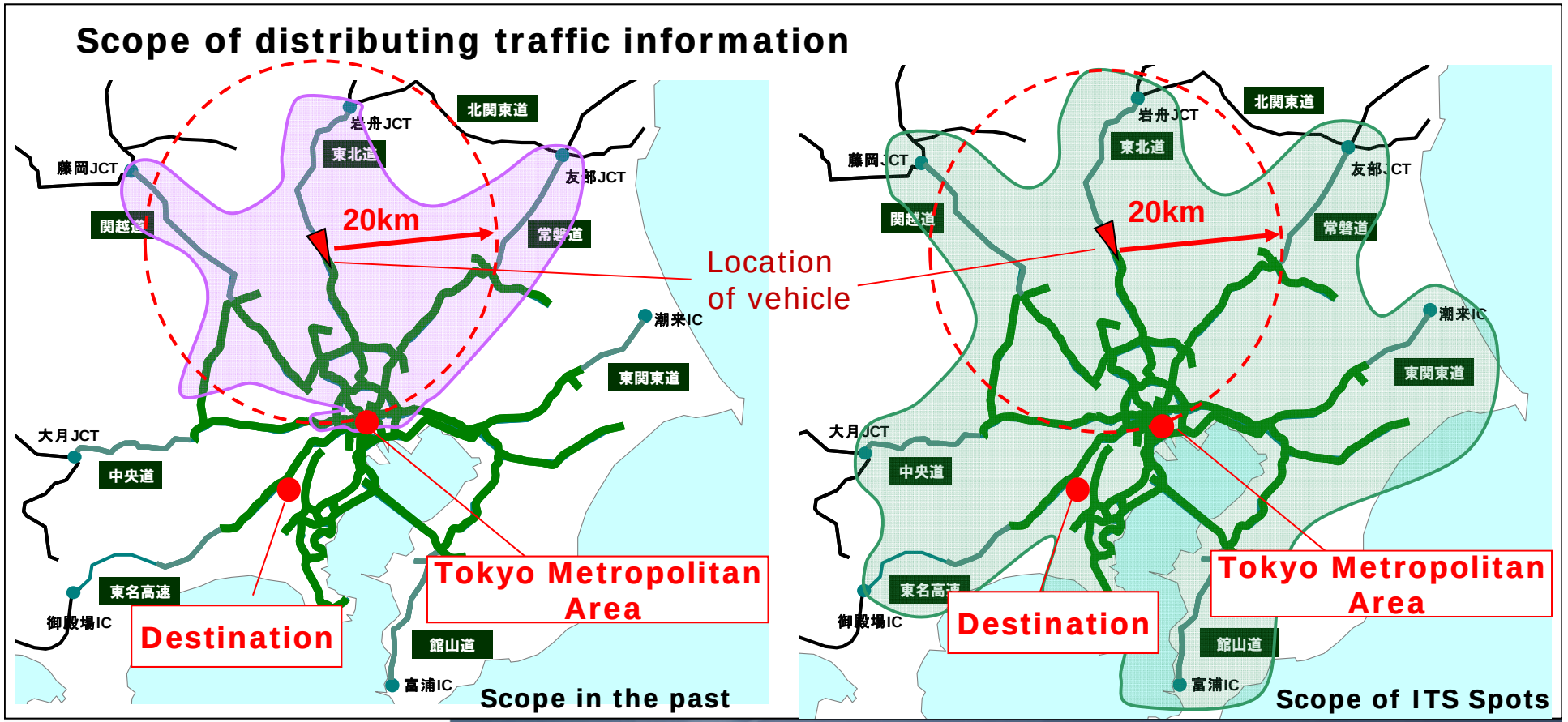
Safety Drive Support

Alert drivers to avoid accident



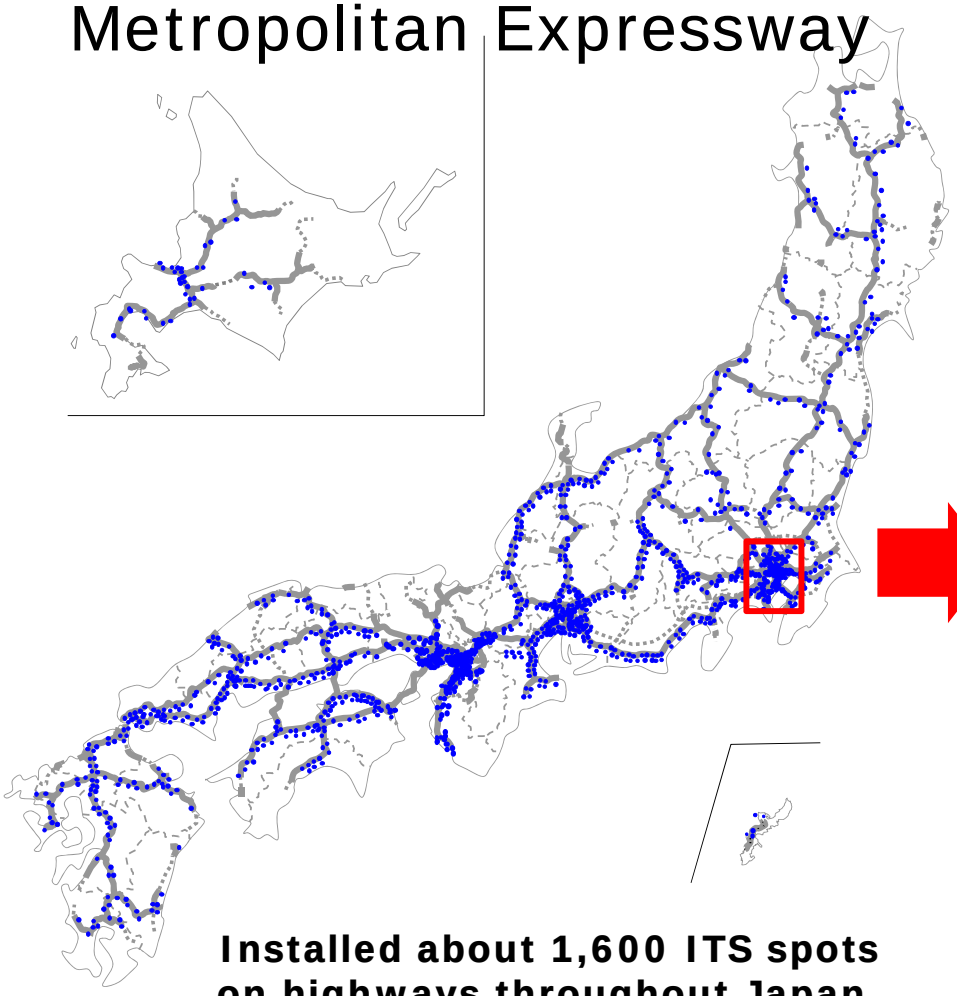
2) ITS Spots Service –DRGS-

- Collect all highway traffic data in Tokyo Metropolitan area through ITS spots and provide the quickest route guidance through car navigation.

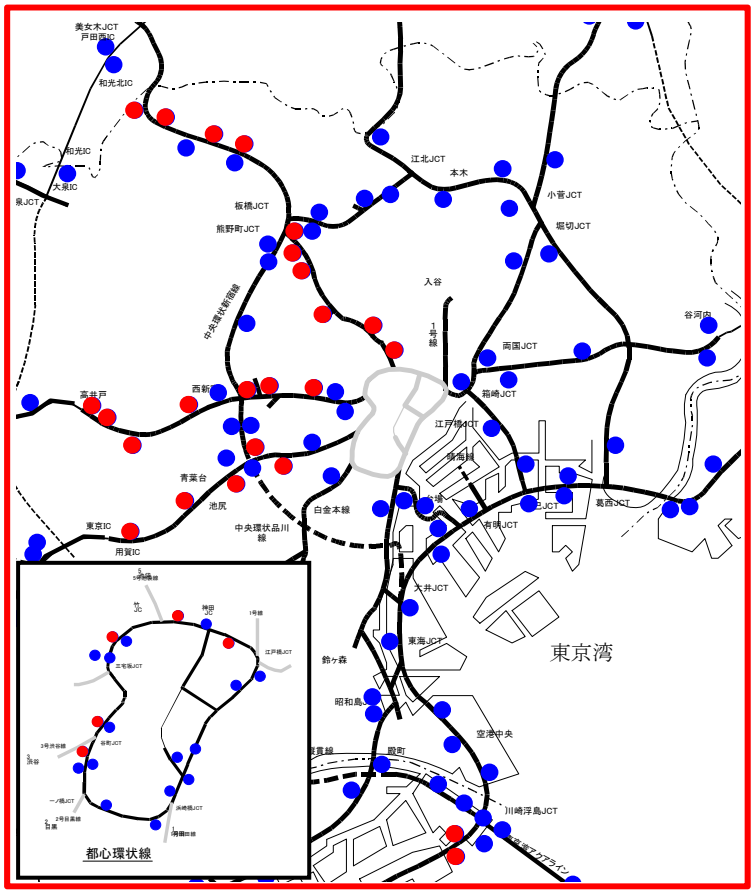


2) ITS Spots Service

- ITS spots increased to 166 spots in Mar 2011 on Metropolitan Expressway



Installed about 1,600 ITS spots on highways throughout Japan.



● In service ● Service started from Jan to Mar 2011

Source: METI

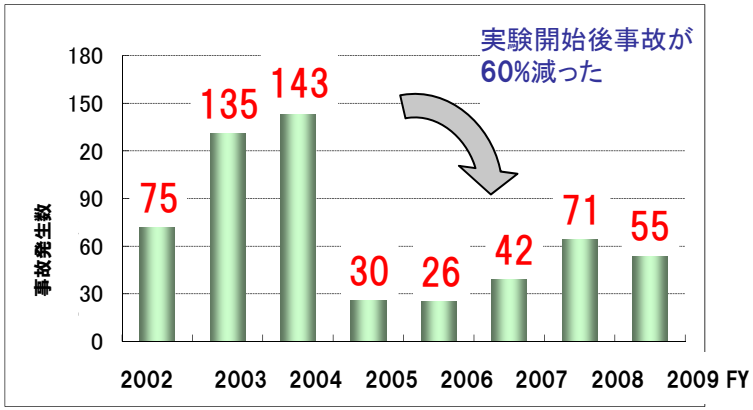
2)Safety Driving Support in Black Area

- Traffic jams at a curve with a high accident incidence were identified through ITS spots, and the driver was alerted.
- The system contributed to a 60% reduction of traffic accidents in this area.

♪この先渋滞しています。
注意して運転してください

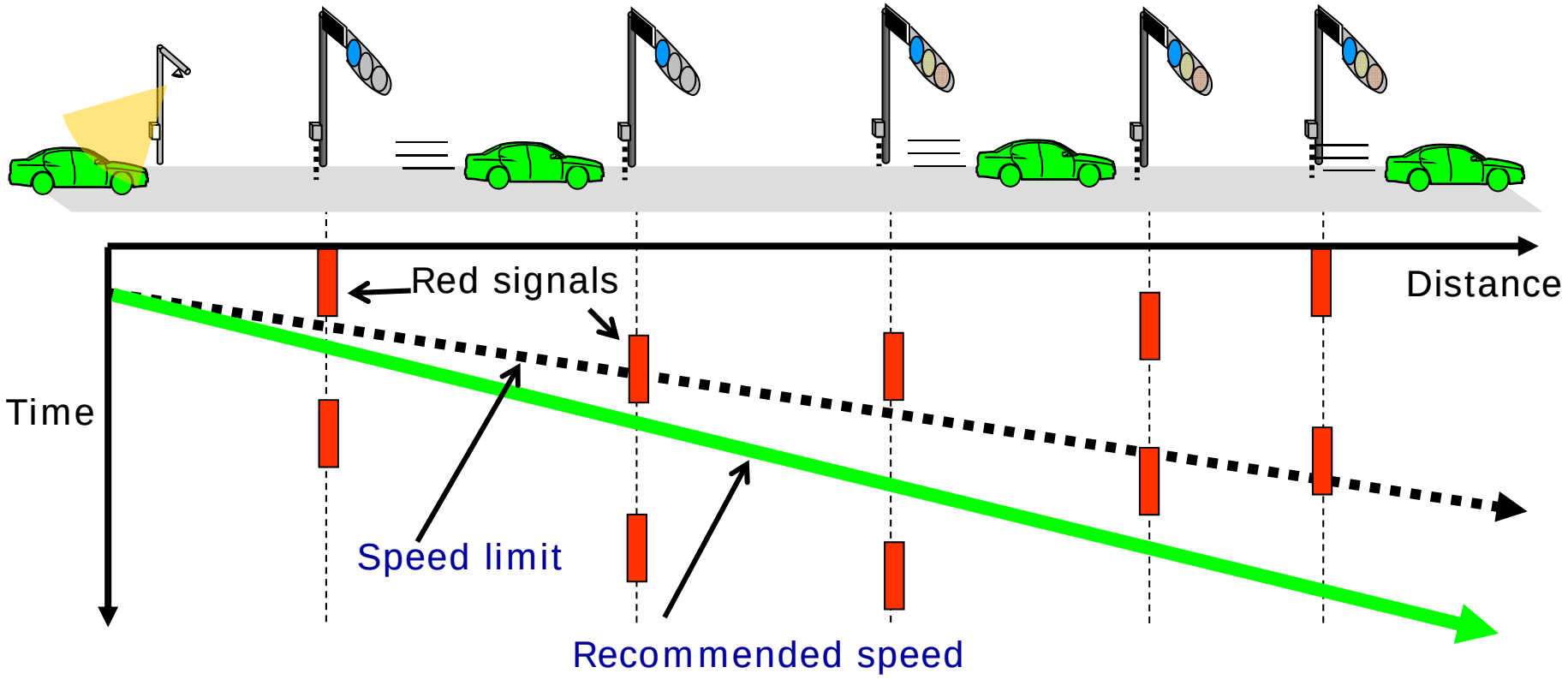
♪この先、事故多発地点です。
スピードに注意

参宮橋カーブにおける事故数の変化



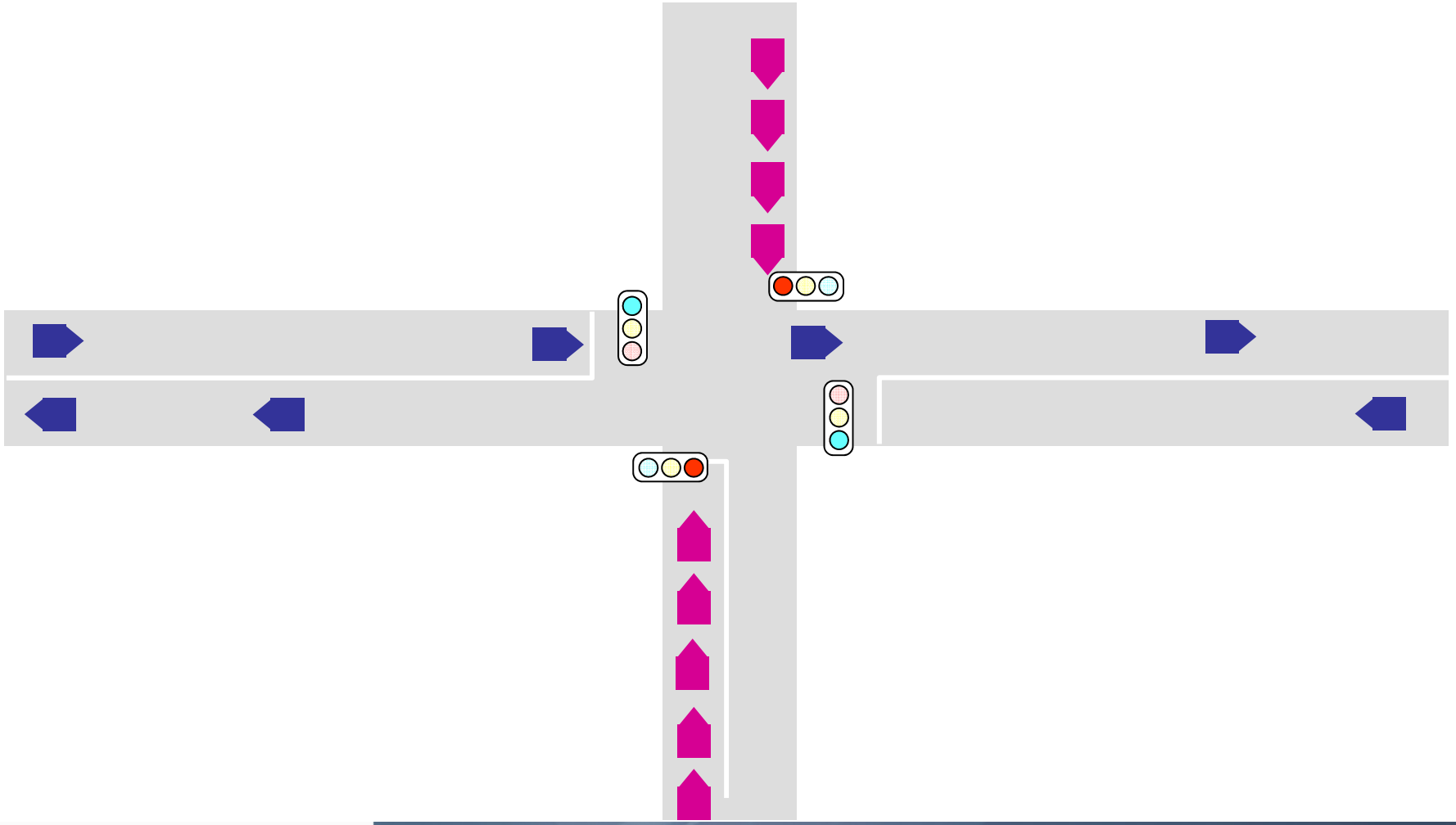
3)Smooth Driving by Harmonizing Traffic Signals

- Road Side Units (RSUs) distribute traffic signal rotation schedule to drivers.



4)Concept of Signal Control

- Green signal on street with light traffic volume will cause congestion on intersecting street.



4)Concept of Signal Control

<Light traffic volume>

Unable to change signal cycle (Green/Yellow/Red)

⇩

Wasted time at green signal and **resultant traffic jams**

<Light traffic volume and green signal>

Drivers tend to increase speed, and pedestrians tend to ignore the signal

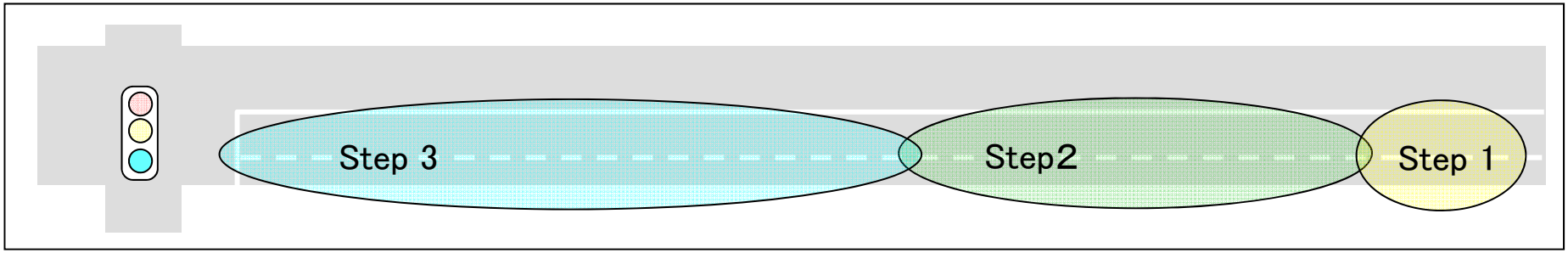
⇩

Cause traffic accident

Maintaining constant distance between vehicles for traffic flow is necessary

→ Harmonize vehicles and roads by advanced signal controls and realize better traffic flow with constant inter-vehicular distance.

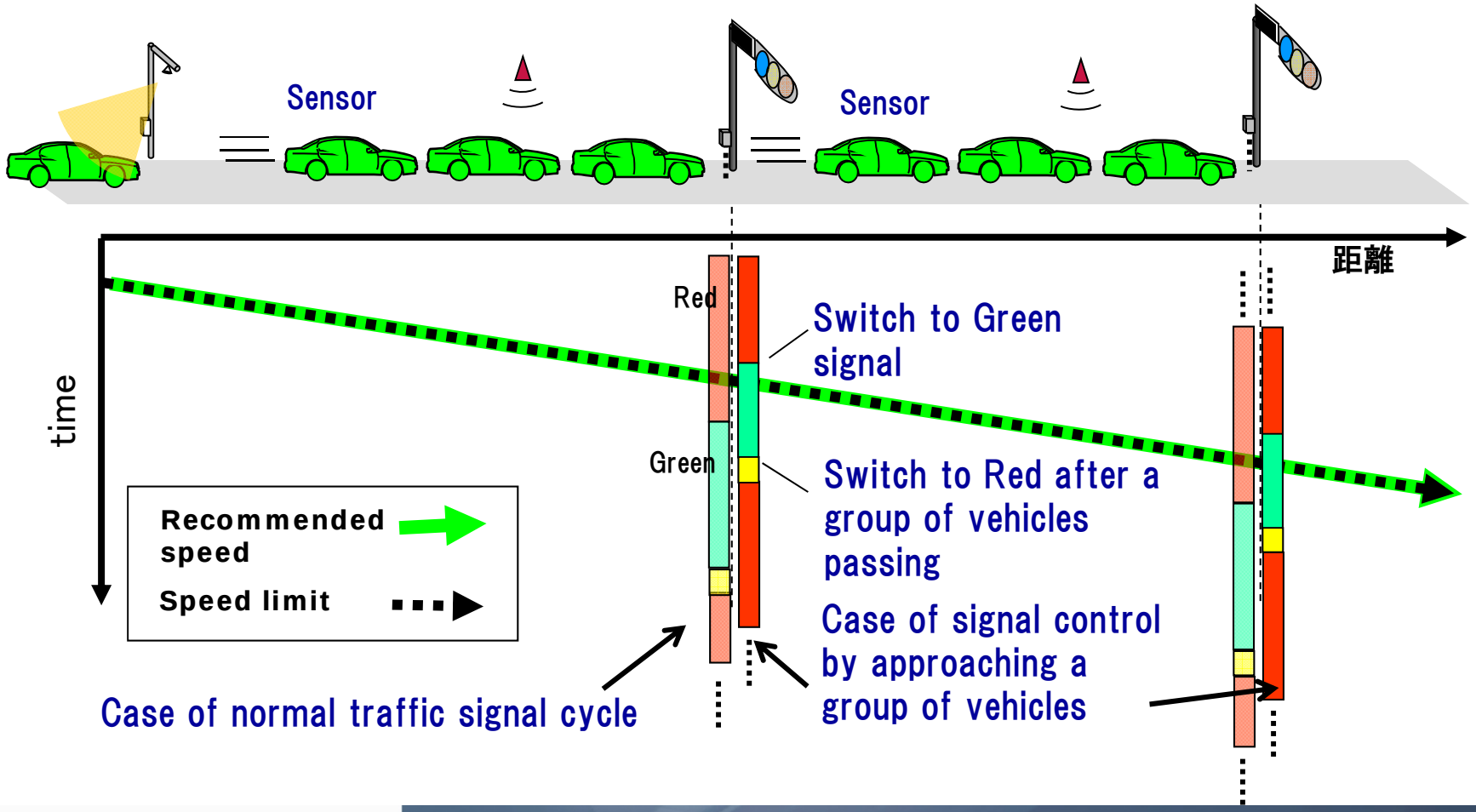
4)System of Signal Control



- Step 1: From road side unit (RSU) near signals, inform driver of recommended driving speed through car navigation.
- Step 2: With a leading vehicle reducing speed to a recommended rate, and with other vehicles following the lead vehicle at a constant distance, a group of vehicles forms that maintains a constant distance and appropriate speed.
- Step 3: By identifying speed of all vehicles through RSUs, better control signal changes for better traffic.

4)Signal Controls harmonizing vehicles

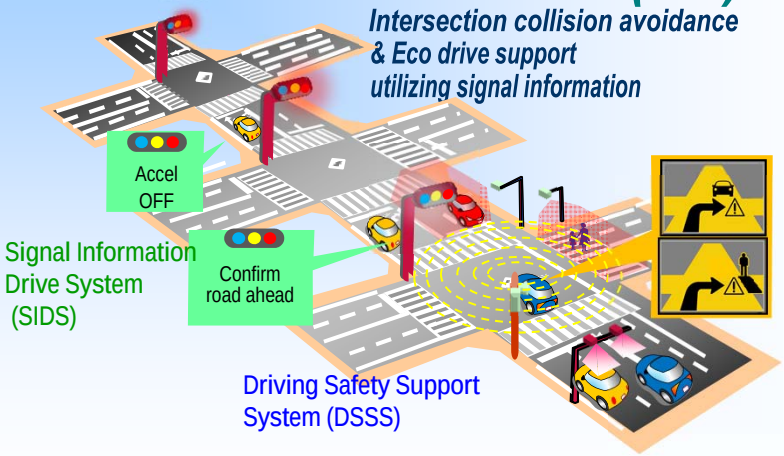
- By identifying speed of all vehicles through RSUs, better control signal changes for better traffic flow.



ITS Green Safety is the cutting edge national cooperative ITS project showcase on the metropolitan Tokyo public road.

GS1 Next Generation DSSS (I2V)

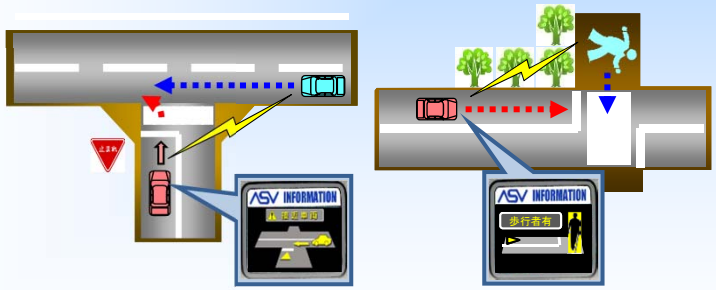
Intersection collision avoidance & Eco drive support utilizing signal information



GS2 Cooperative Advanced Safety Vehicles (V2V, V2P)

ASV-5 ADVANCED SAFETY VEHICLE

Intersection driving support systems by V2V, V2P communication

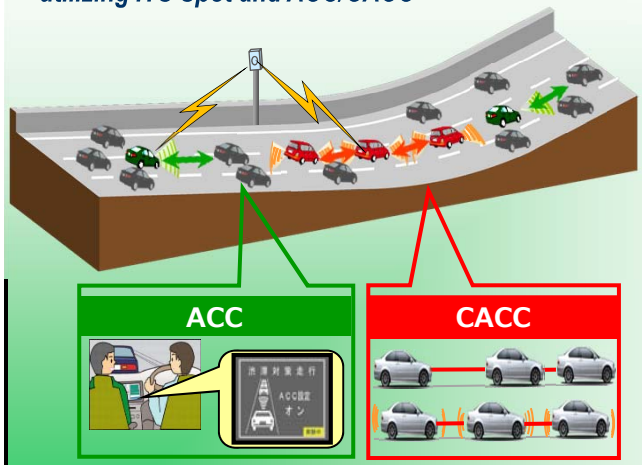


ITS GREEN SAFETY

For a Greener & Safer Traffic Society

GS4 Cooperative Service towards Smooth Traffic Flow at expressway SAG sections (I2V, V2V)

Mitigating SAGs-congestions on expressways utilizing ITS Spot and ACC/CACC



GS3 ITS Spot Services (I2V)

Experience on the Tokyo metropolitan expressway the world's first cooperative service

GS5 New Generation Cooperative ITS Services linking ITS Spots and mobile network (I2V)

Safe and confortable urban transportation by new traffic information networks