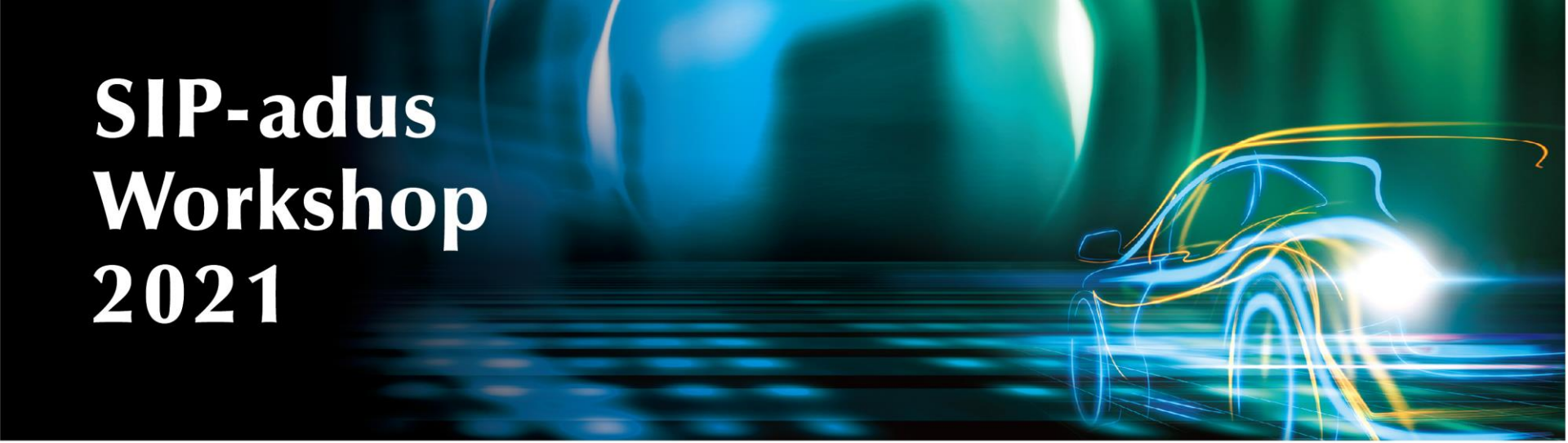


SIP-adus FOTs in Tokyo waterfront area

– Toward the realization of cooperative autonomous driving–

Masato MINAKATA（TOYOTA MOTOR Co.）

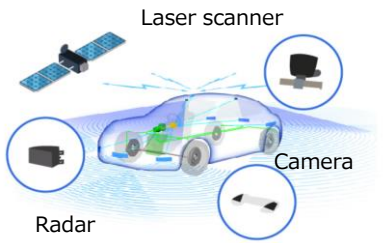
SIP

Cabinet Office

Traffic environment info. in autonomous driving

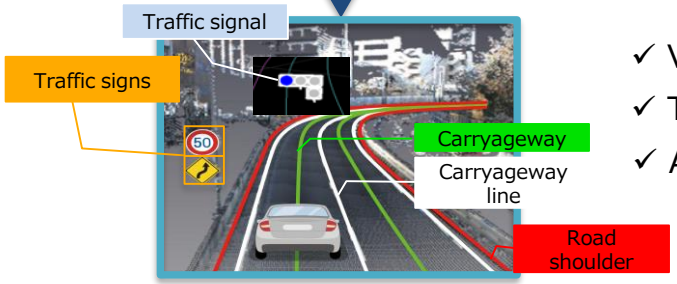
Mechanism of automomous driving

Sensed data



Dynamic map

Signal info.
Merge support information
Traffic regulation information
Traffic jam end information
HD 3D map etc.



Traffic environment info.

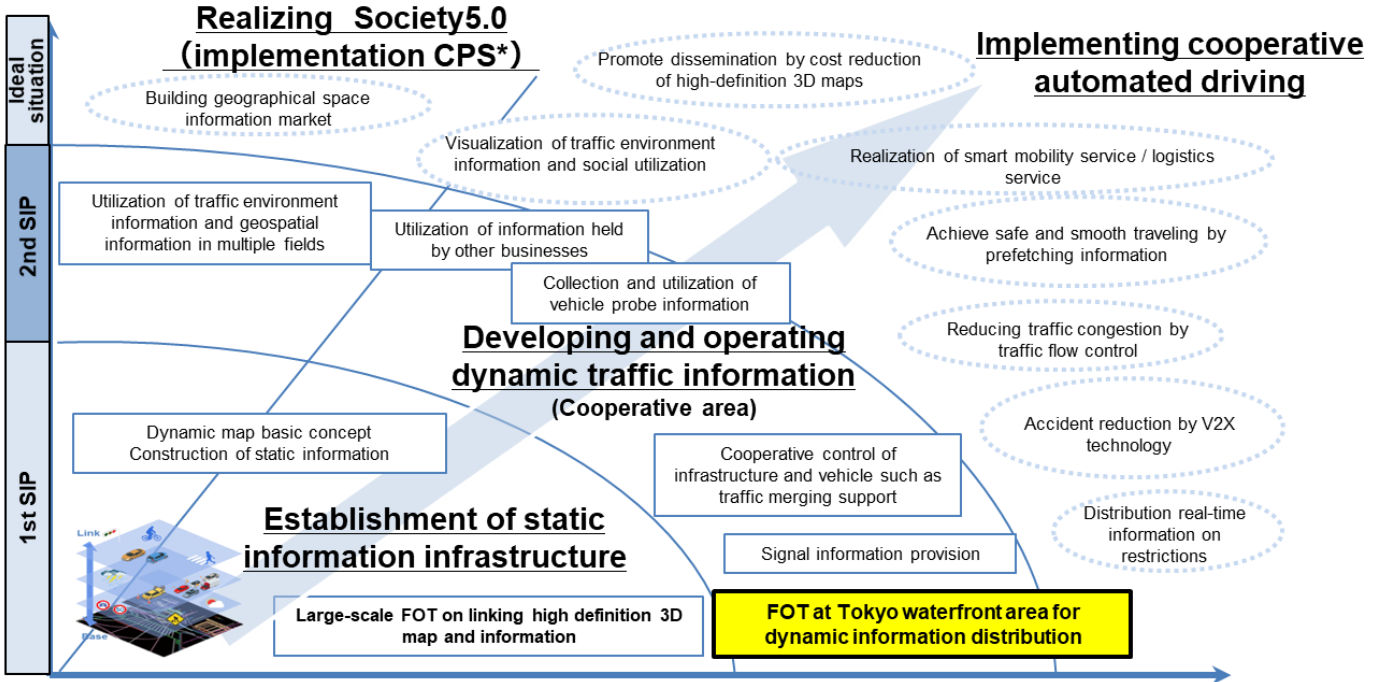
- ✓ Vehicle position estimation
- ✓ Travel route planning
- ✓ Advanced driving support

Development in the area of cooperation

Realization of Society 5.0

Roadmap for traffic environment information

- Formulated "Traffic environment info. construction and utilization roadmap" and worked on standardization and practical application through demonstration experiments.



Initiatives through FOTs

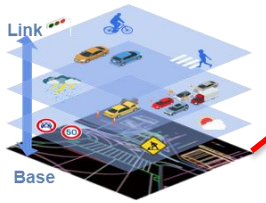
◆ As a milestone for practical use, continue to work on FOTs in actual traffic environments.

SIP Phase 1 Large-scale FOTs(FY'18)

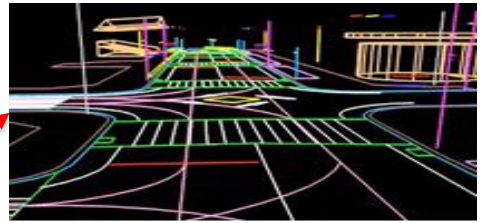
Practical use of HD 3D maps

(FOT result)

✓ From '19, Dynamic Map Platform Co., Ltd. started a map provision business for about 30,000 km of expressways and motorways nationwide.



(Dynamicmap)



(HD 3D map data)

Nissan・Honda・Toyota Adopted for advanced driver assistance system

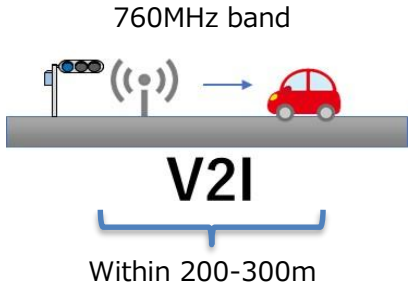
Initiatives through FOTs

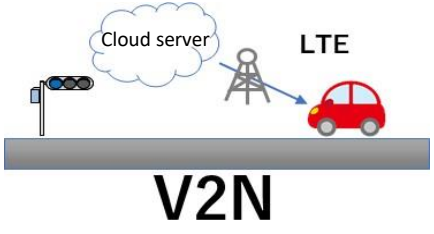
SIP Phase 2 FOT in Tokyo Waterfront area(FY19～FY20)

Construction of a mechanism for dynamic info. utilization using wireless communication

- Demonstration by **narrow-range wireless communication (V2I **)** using a dedicated frequency band assigned to ITS * applications to establish specifications for providing **signal info.**.
- Demonstrate technical feasibility with **wide area public network communication (V2N ***)** to build a mechanism for **collecting and utilizing private probe data** from POV.

(Ex. Signal info. distribution)





*ITS : Intelligent Transport Systems
**V2I : Vehicle to Infrastructure ***V2N:Vehicle to Network

Outline of FOTs

Objects

- **Promote practical application and standardization** in an internationally open experimental environment in an actual traffic environment.
- **Industry-academia-government collaboration** to draw out private investment and promote research and development in the form of a matching fund.
- Opportunity **to foster social acceptance.**

Location

Tokyo waterfront city area

- Realization of highly autonomous driving on general roads

Haneda airport area

- Realization of next-generation public transportation system (ART) by self-driving bus

Metropolitan expressway

- Realization of safe and smooth autonomous driving by look-ahead info.

Environment preparation

SIP

- Development and maintenance of infrastructure facilities

Sharing

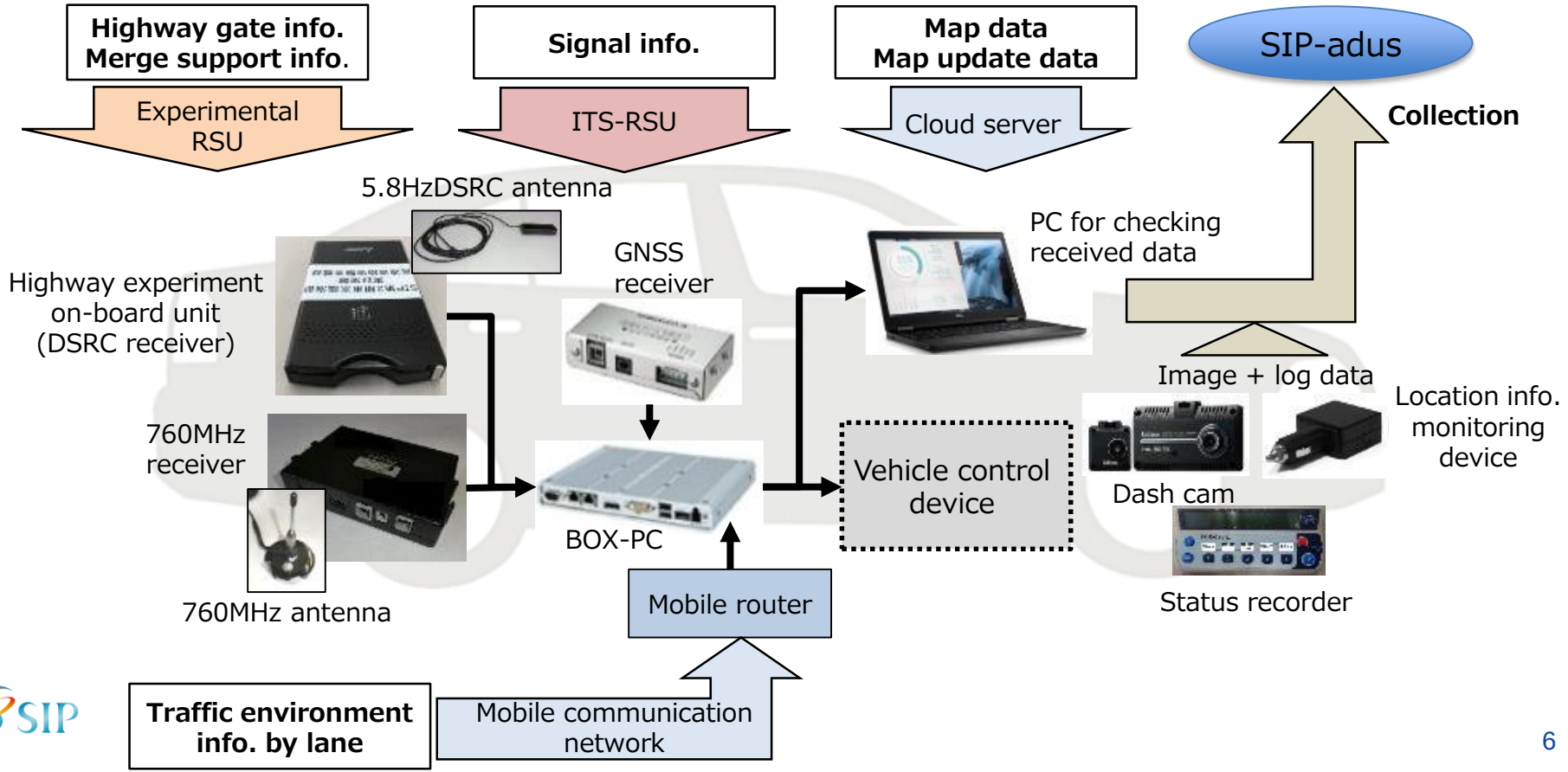
Participants

- Preparation of experimental vehicles
- Experimental personnel / expenses

Participants

SIP

Outline of FOT environment

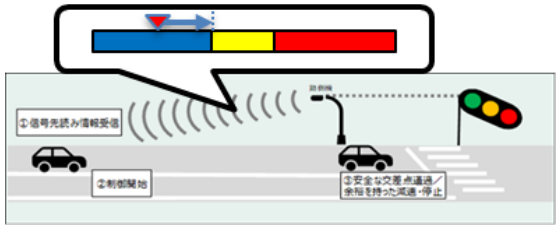


Signal information provision

◆ FOT of “Signal information provision" by communication (V2I)

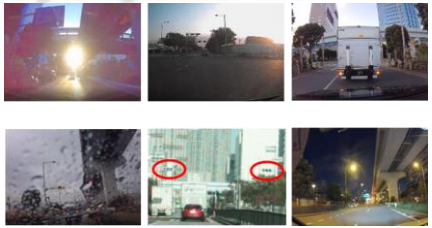
Narrow-range wireless communication equipment (V2I) installed at 33 intersection traffic lights in Odaiba

Distribution of signal light color & remaining seconds info.



Results

- Confirmed that signal recognition is possible in a stable manner even in **various environments** based on the signal light color info..



Outcome

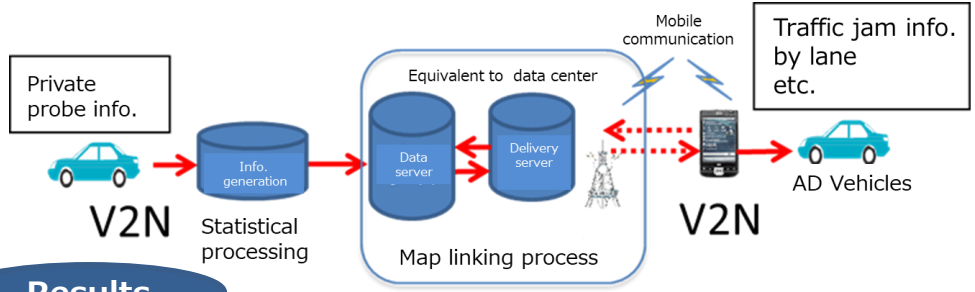
- Confirmed on the specifications for signal info. distribution from the infrastructure that meet the requirements for autonomous driving.
- Confirmed the effectiveness of signal info. through communication for the safe and smooth social implementation of AD vehicles, it was also confirmed that infrastructure development was required on a regional basis for the implementation area.

In FY2021, SIP expand the efforts to distribute signal information by **V2N**, which is effective for infrastructure development on a regional basis.

Collection and utilization of probe information

◆ **FOTs of a mechanism to collect and utilize probe info. in an actual traffic environment**

By statistical processing of **probe info.** collected in real time from traveling vehicles, **traffic jam info. for each lane** is generated and distributed by **V2N**.



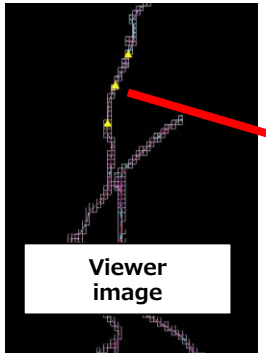
Outcome

- Completed a **feasibility study** on the generation and distribution feasibility of traffic environment info. for each lane by statistically processing the collected probe info..

Results

- Demonstrated that it is possible to generate traffic jam tail info. **for each lane** by statistical processing from probe info. with lane level accuracy.

SIP (Lane Lv.)



JARTIC* (Roadway Lv.)

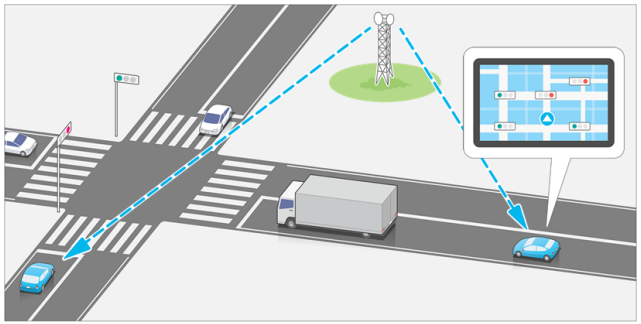
*JARTIC: Japan Road Traffic Information Center

In FY2021, SIP work to improve the accuracy and freshness of the info. generated and distributed by **expanding the collected probe info.** and to build a mechanism for practical use.

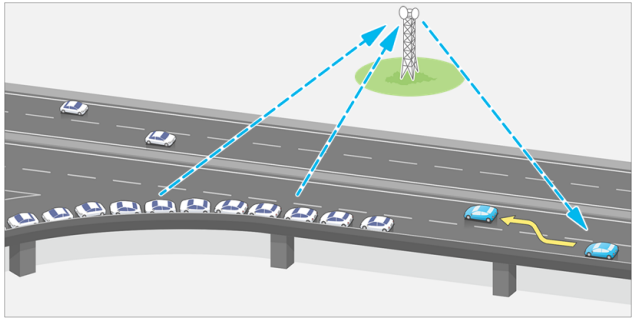
Aiming through 21FY FOTs

◆ **By utilizing traffic environment info., driver info. is provided, advanced driver assistance systems, and automated driving system application scenes are expanded.**

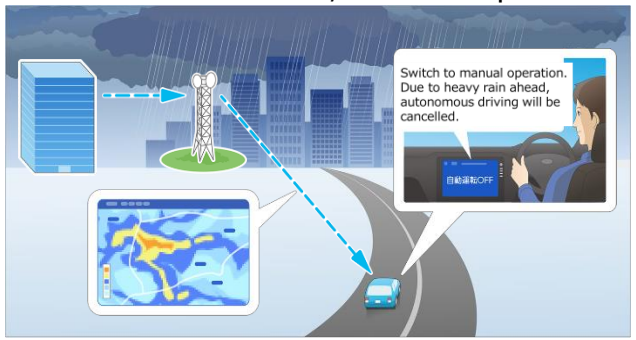
- **Driving support and autonomous driving on general roads using signal info. on a regional basis**



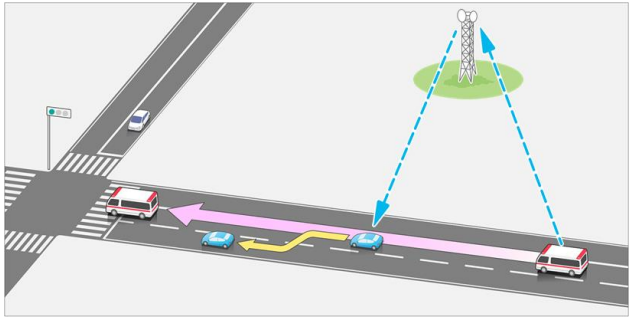
- **Smooth lane change by forecasting traffic lanes**



- **Predict early guerrilla rainstorms**
  (Avoidance route, manual operation switching)



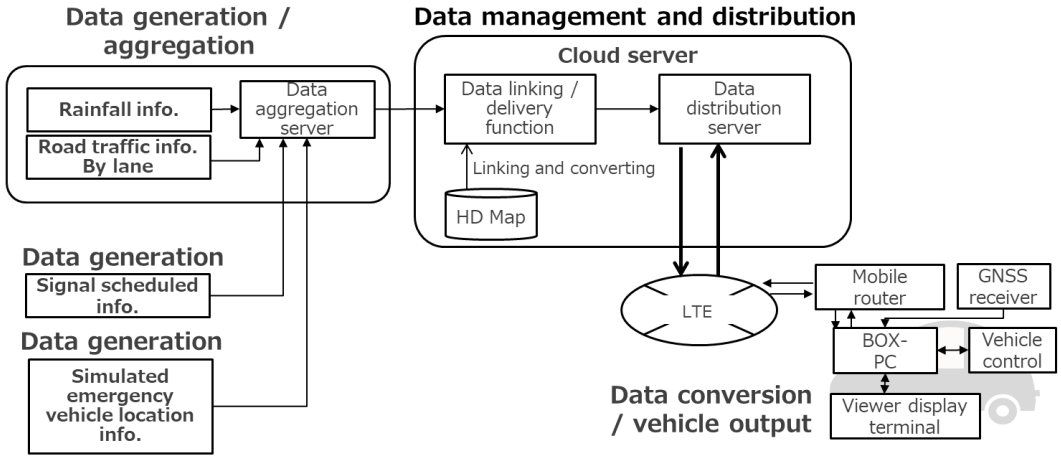
- **Warning and avoidance of approaching emergency vehicles**



Outline of 21FY FOTs

◆ **Utilize new traffic environment info. to expand the operation scene of AD vehicles in the Tokyo waterfront area**

- **Building a new info. generation and distribution FOT environment in the Tokyo waterfront area through a public network (V2N *) in anticipation of practical use**



- **Participants**

Alphabetical order. A total of 22 institutions

*V2N: Vehicle to Network

Information distribution method

◆ **Specification planning and verification for efficient distribution of necessary info. from a data server**

＊In collaboration with info. users, formulate an optimal distribution method assuming use cases.

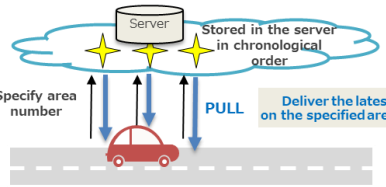
(Requirements)
- ✓ **Timely use of info.**
- ✓ **Reduction of communication traffic**

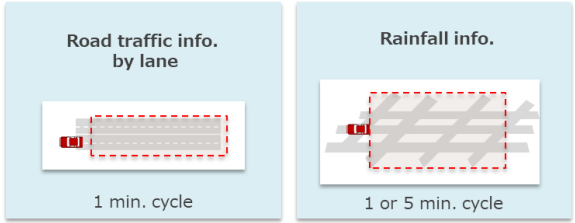
Experimental verification

(Achievement)
Industry guidelines and standardization of info. distribution methods

- Info. with **low immediacy**
- **Medium and wide area info.**

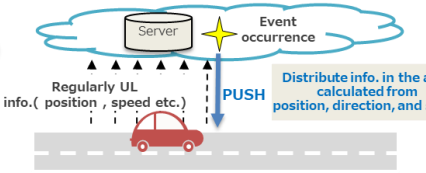
PULL method

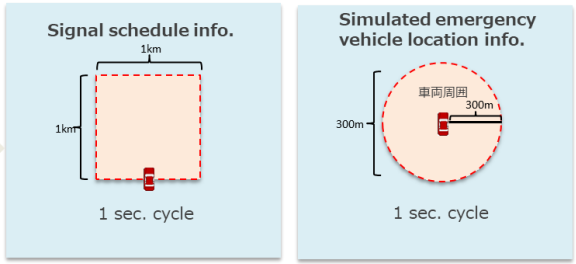




- Info. with **high immediacy**
- **Narrow area (around own vehicle) info.**

PUSH method





Signal schedule information is also distributed by PULL method

Network requirements

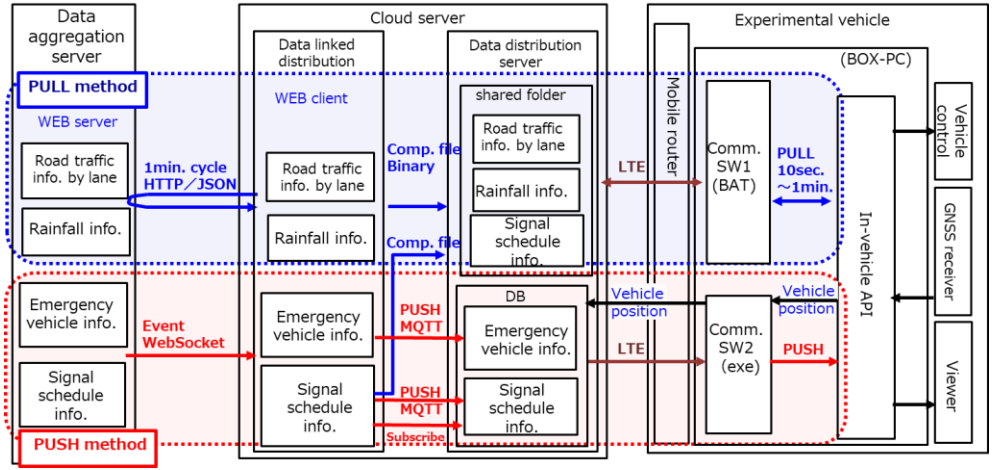
◆ **Interface planning in networks and verification of issues and requirements for infrastructure at the time of social implementation**

＊In collaboration **with ICT operators**, SIP devised a network environment that realizes architecture and info. distribution methods.

(Requirements)
- ✓ **I / F that realizes information distribution method**
- ✓ **Network requirement design premised on social implementation**

Experimental verification ＋Social implementation simulation

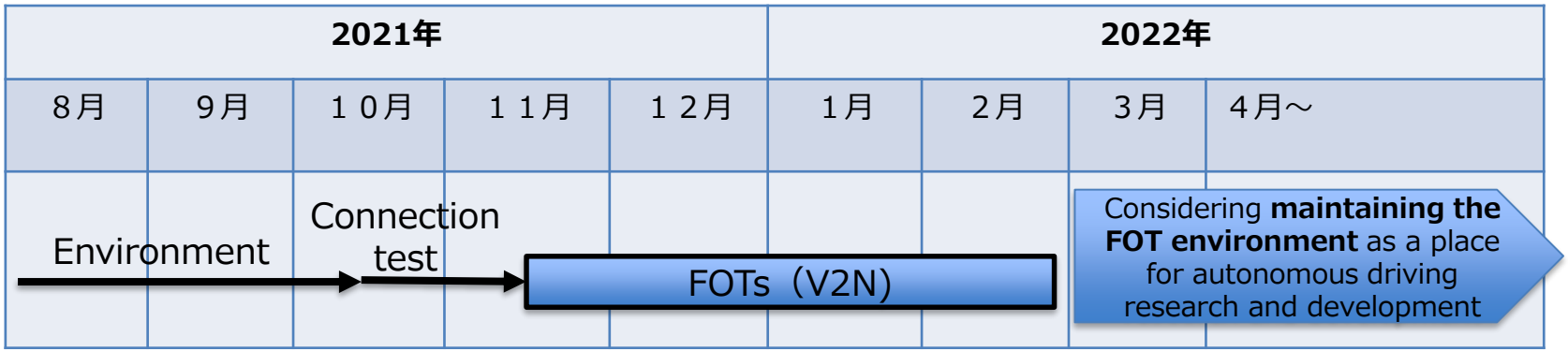
(Achievement)
Clarification of infrastructure requirements and standardization of I / F



Summary

- SIP confirmed the effectiveness of signal info. distribution by V2I and decided the specifications of signal info. distribution from the infrastructure that meet the requirements for autonomous driving.
- Completed a feasibility study by V2N on the collection and utilization of private sector probe info..
- In FY2009, SIP will work on a new FOT using V2N with the aim of putting into practical use the expansion of the dynamic traffic environment info. utilization scene.

- **Schedule** (Detailed schedule is being adjusted for each delivery info.)



- **Official Site of FOTs :** https://www.sip-adus.go.jp/fot/


SIP-adus
Workshop
2021
Thank you