The Future created by Vehicle Big Data and Edge Computing

クルマのビッグデータが作る未来と エッジコンピューティング

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What is Connected Vehicle?

Use-case view

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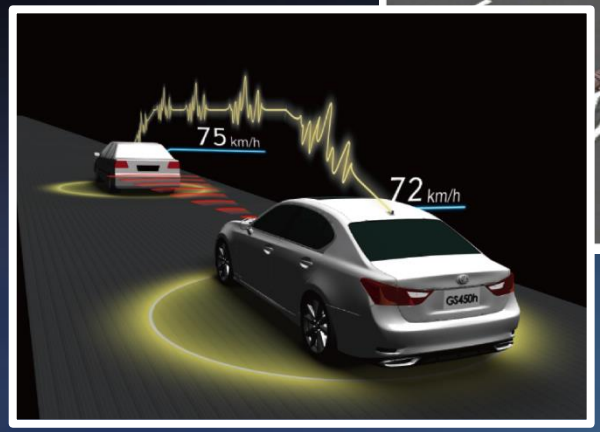
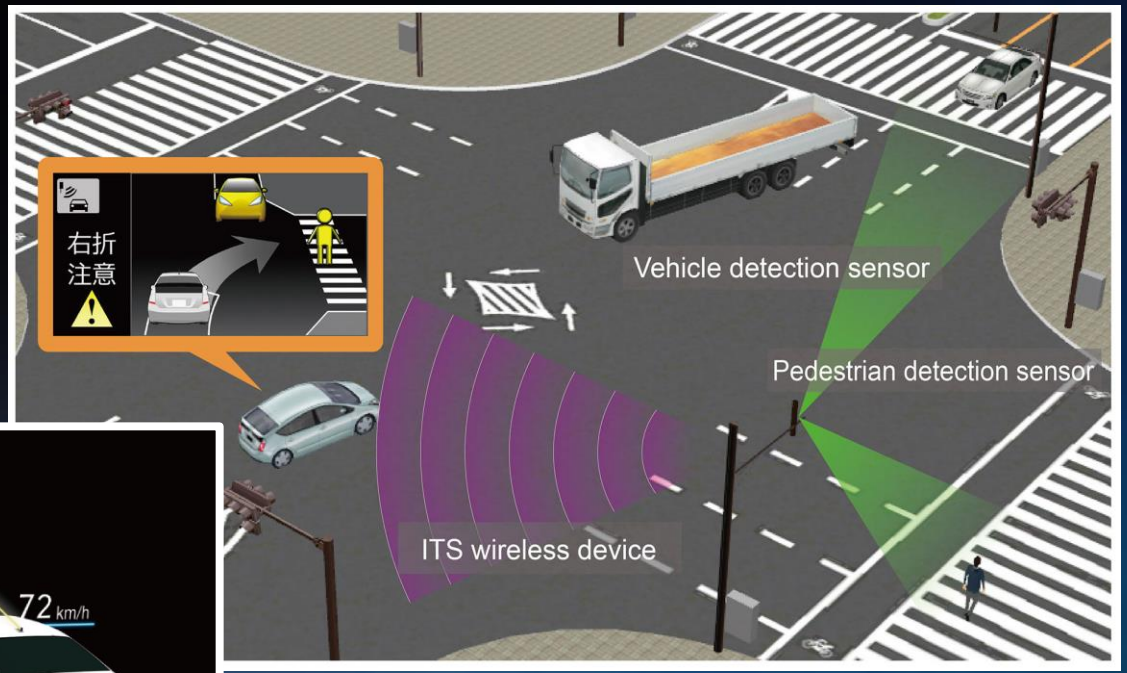
ITS: Intelligent Transportation System

Cruise Control





Collision prediction & warning

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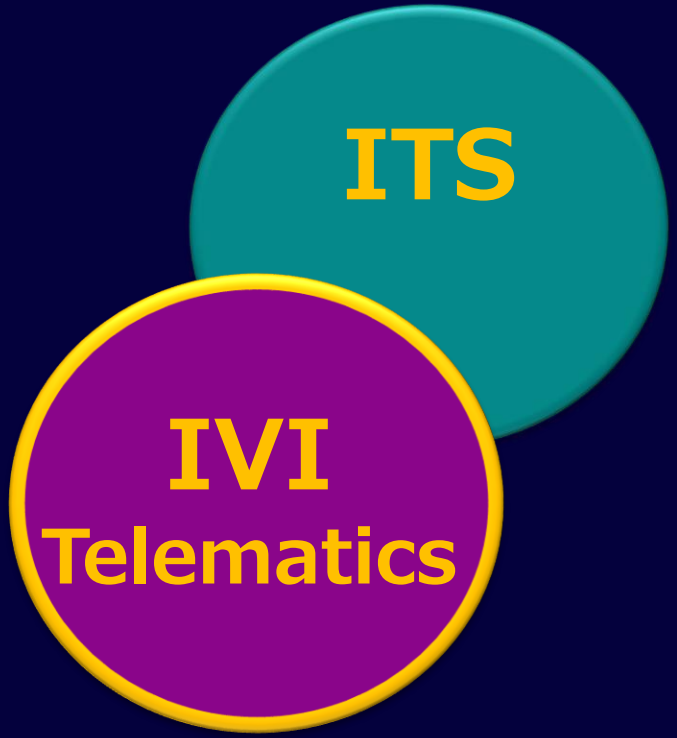
What is Connected Vehicle?

Use-case view



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Automatics Crash Notification (1/2)

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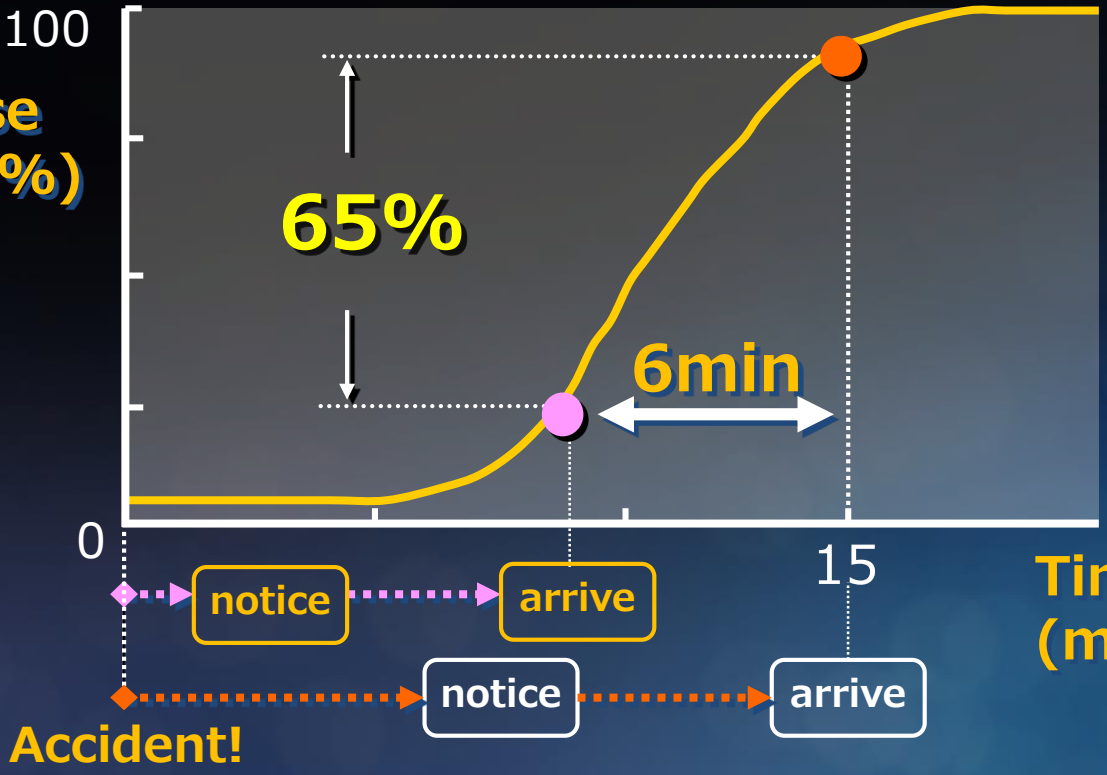
Automatic Crash Notification (2/2)



事故後の経過時間と死亡率

(呼吸停止の場合)

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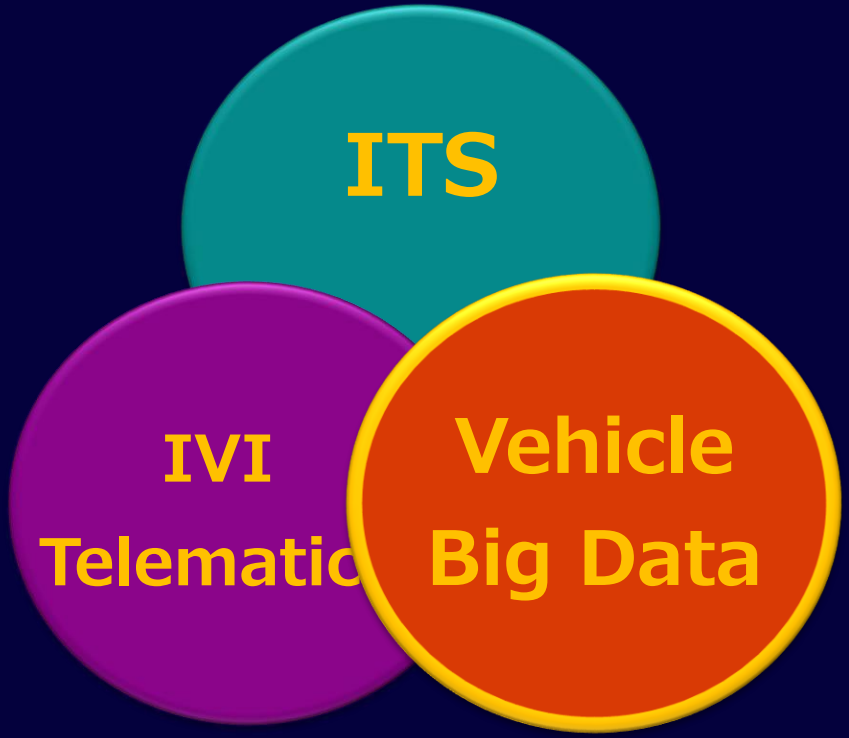
What a Connected Vehicle can do?

Use-case view



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e-Care Vehicle Maintenance Service

❶ Warning

Connected Car

❷ Diagnostic Data

Toyota Smart Center

Big Data

❸
- Analysis
- Root Cause
- Judge
- Advice

❹ Vehicle Health Data

❺ Support

Operator

Notification

Service

❺ Support

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Automotive business

Mon-automotive business

R&D, Engineering

Vehicle functions

・Use-case Analysis
・Next Gen Design
・EDER

・Autonomous Driving
・ADAS etc.

Telematics Services

Insurance, Finance

・Driving advise
・Remote functions
・SOS/HELP

・AYD insurance
・Resale value
・E-Toll

Vehicle Cloud

Data Analytics

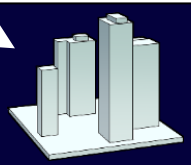
Anonymity
Filtering
AI etc.

Processed Data

Public Data

Public Cloud

Other business



ECU Data
Sensor Data
Driver Monitor

Marketing

・Marketing Analysis
・Recommendation

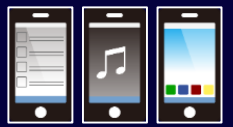
Maintenance

・Defect Analysis
・Predicting Failures

MaaS

・Traffic Info
・Traffic Control
・Sharing
・Multi-modal

Smartphone



・Music
・SNS

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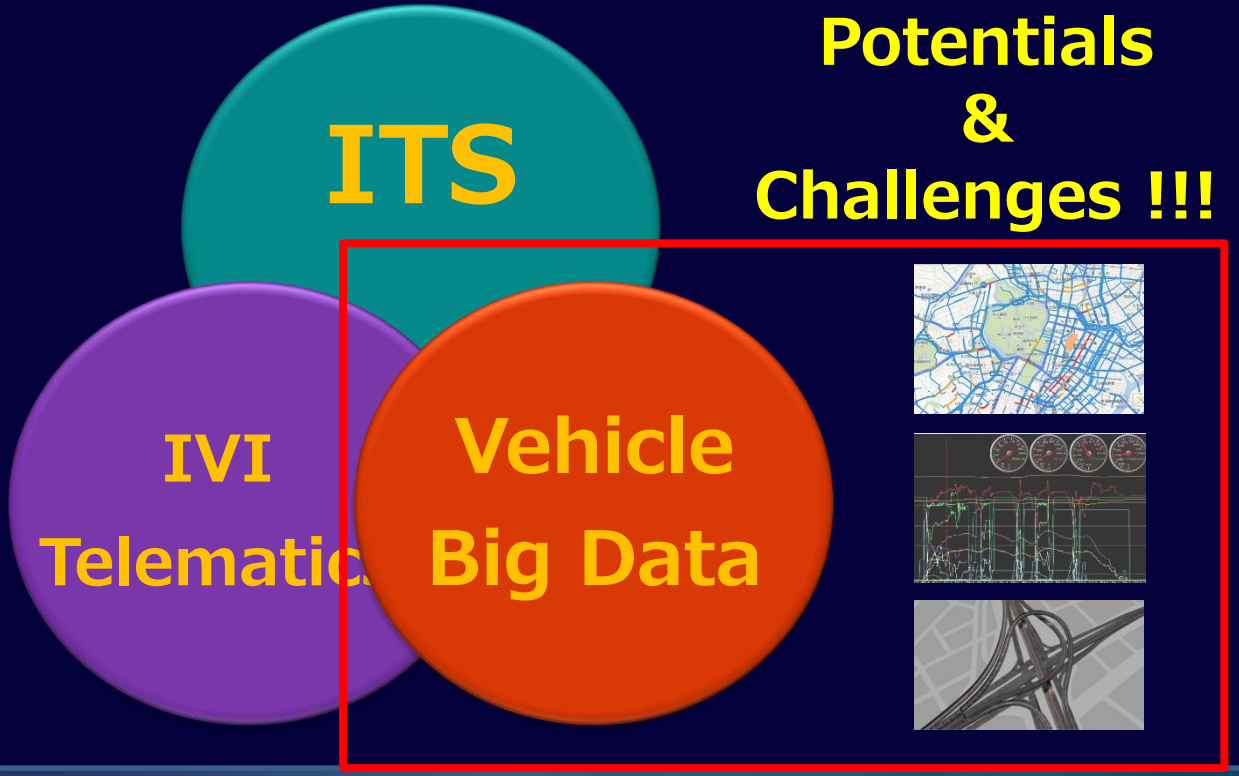
What a Connected Vehicle can do?

Use-case view



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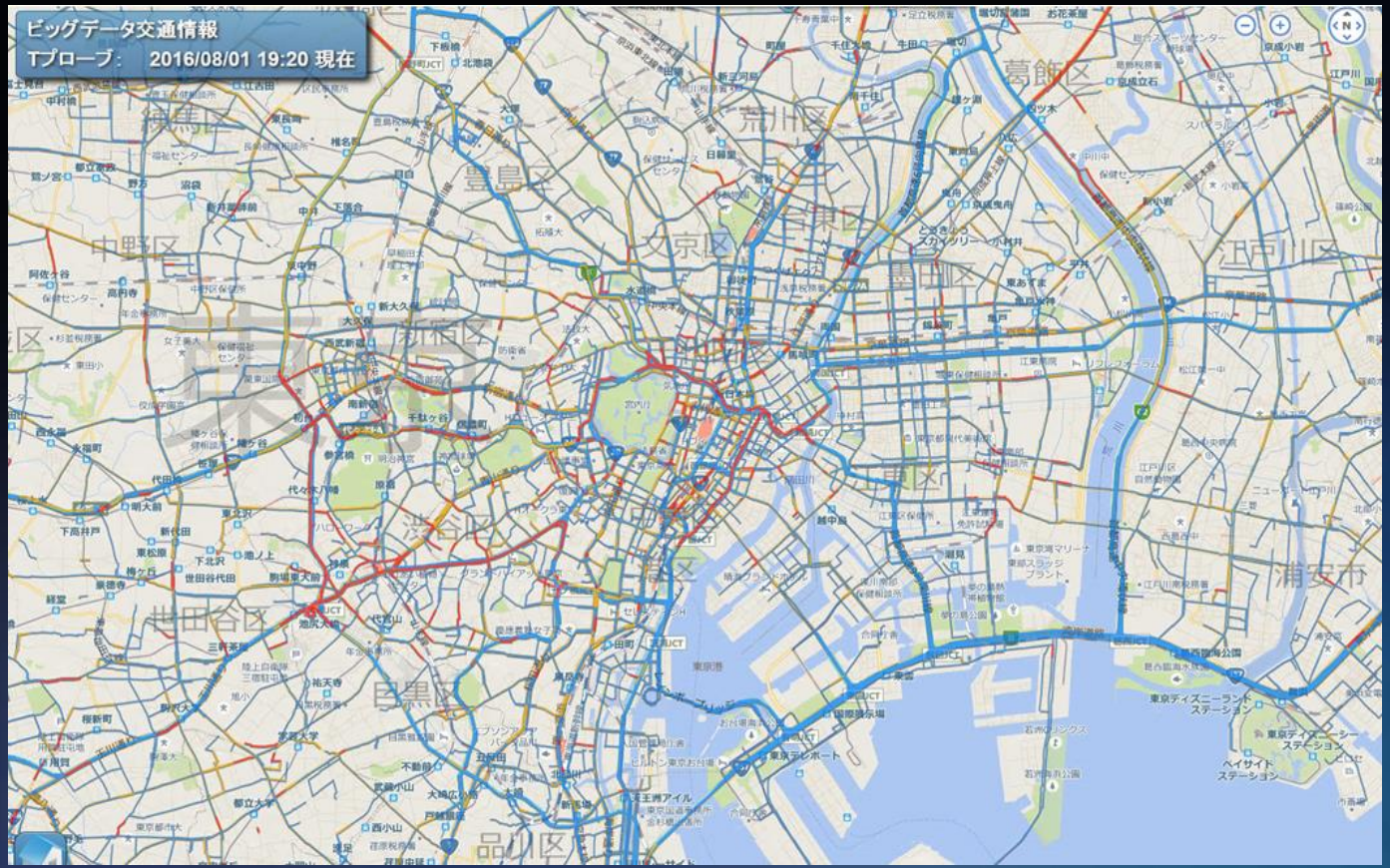
Dynamic Map Service (1/3)



Current Traffic

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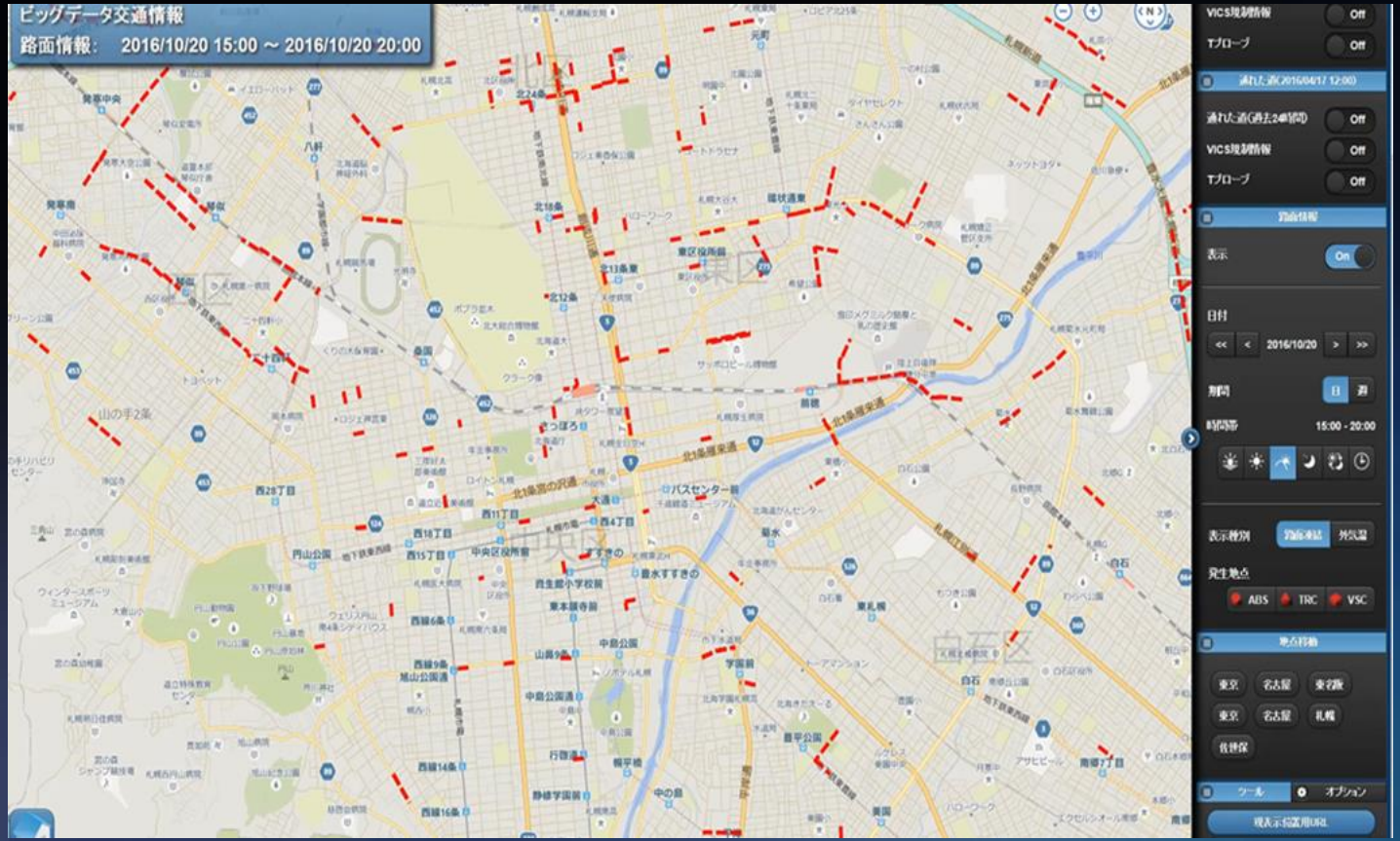
Dynamic Map Service (2/3)



Predicted Traffic

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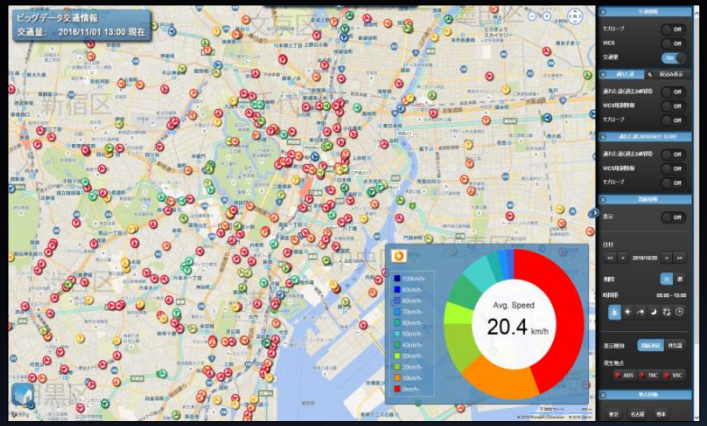
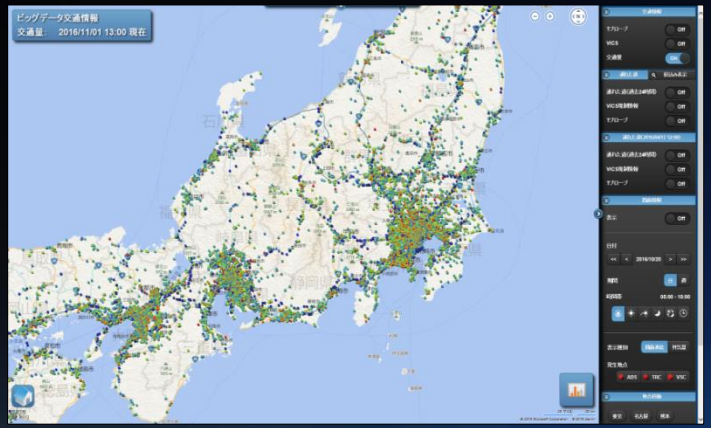
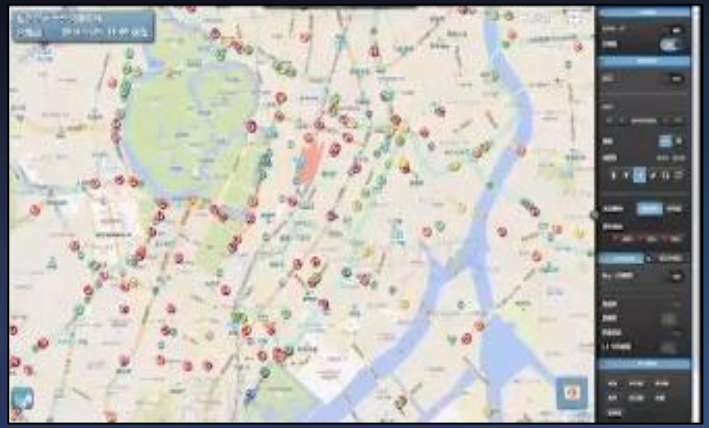
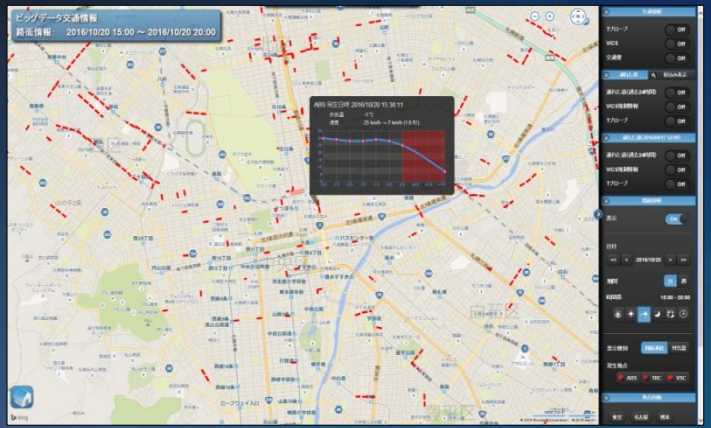
Dynamic Map Service (3/3)









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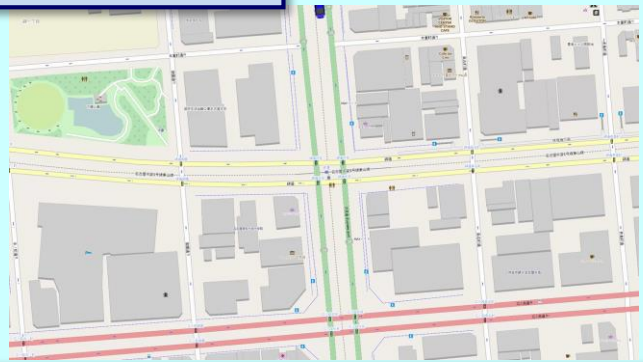
Camera Image + Localization

Road surface analysis

Image integration



Map generation

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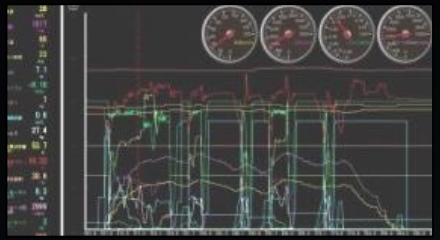
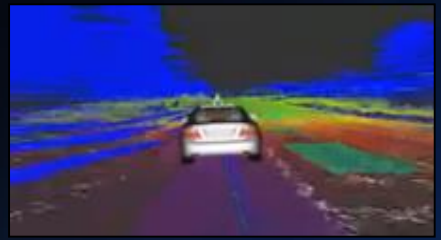
Volume of future Connected Car Data

Location probe
～xxxMB/mon
[always]

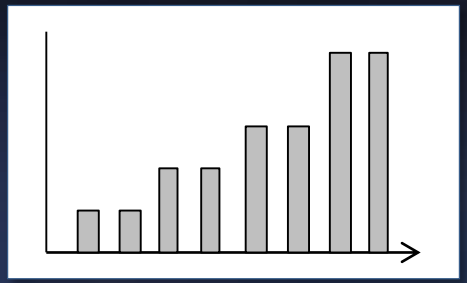


ECU state data
～xGB/mon
[upon event]

Dynamic map
～xGB/mon
[upon event]

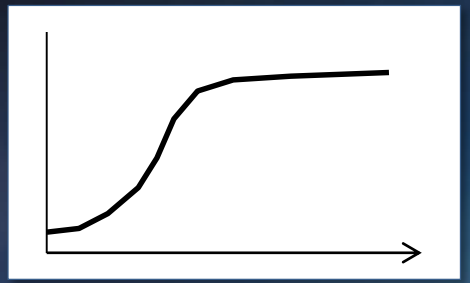


Sensing data
～xxGB/月
[upon event]

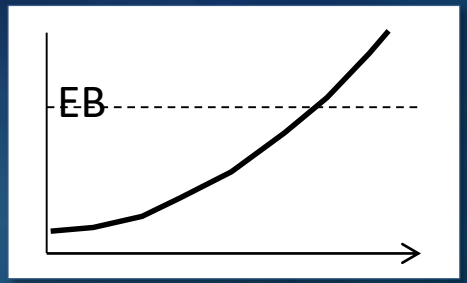


Data size per Car

×



Number of Connected Cars



Connected Car Data in total

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Challenges

- # of Connected Cars : **10M+ cars**
- 1K+ sensor data type per vehicle
- Camera image / video
- 1-10sec real-time response

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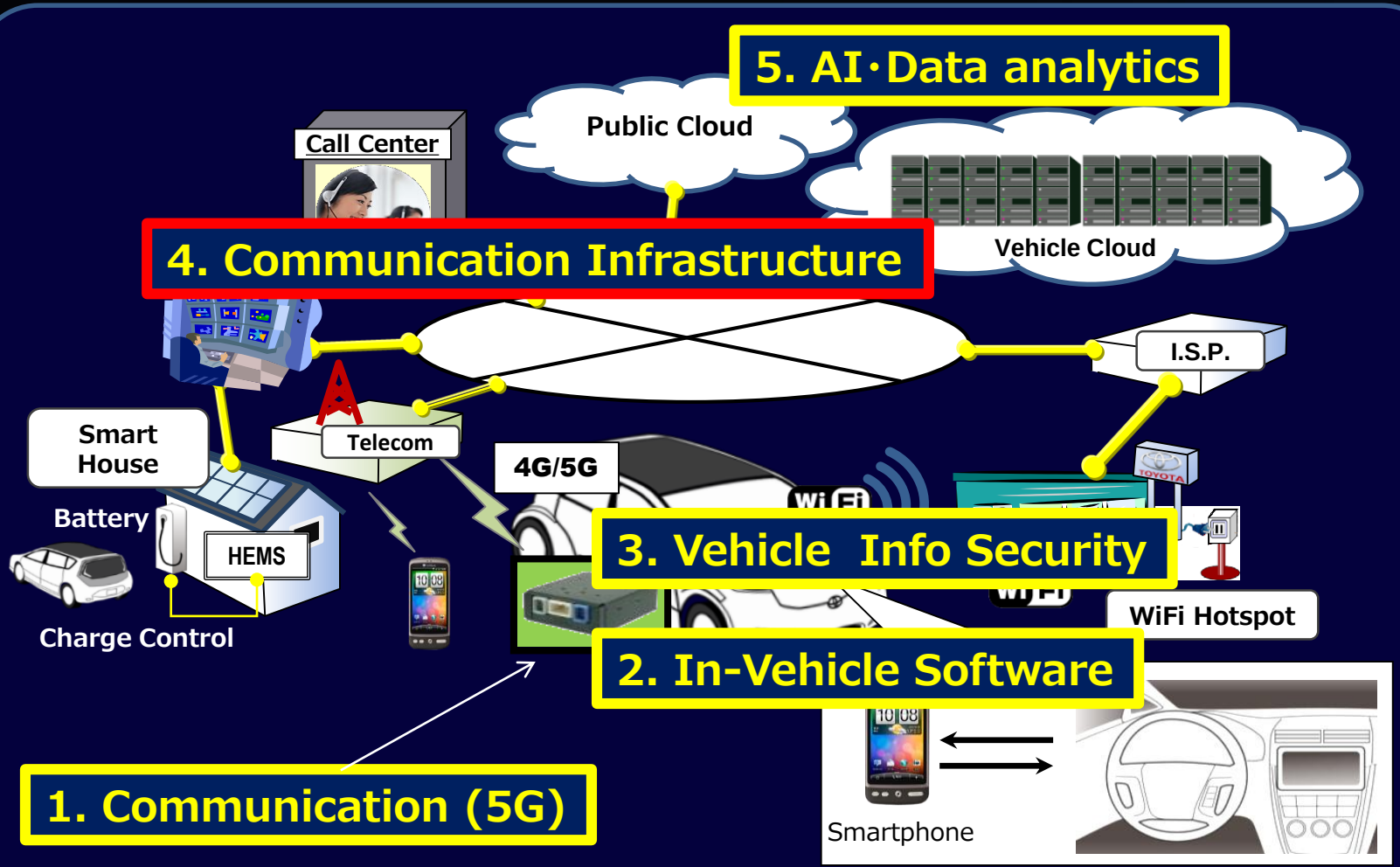

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Analysis of Vehicle & its environment

Collection, Store, Analyze

Edge Cloud Computing

Edge Device Computing

Data Filtering

End2End Orchestration

DC

IoT Network

5G

Real-time Feedback

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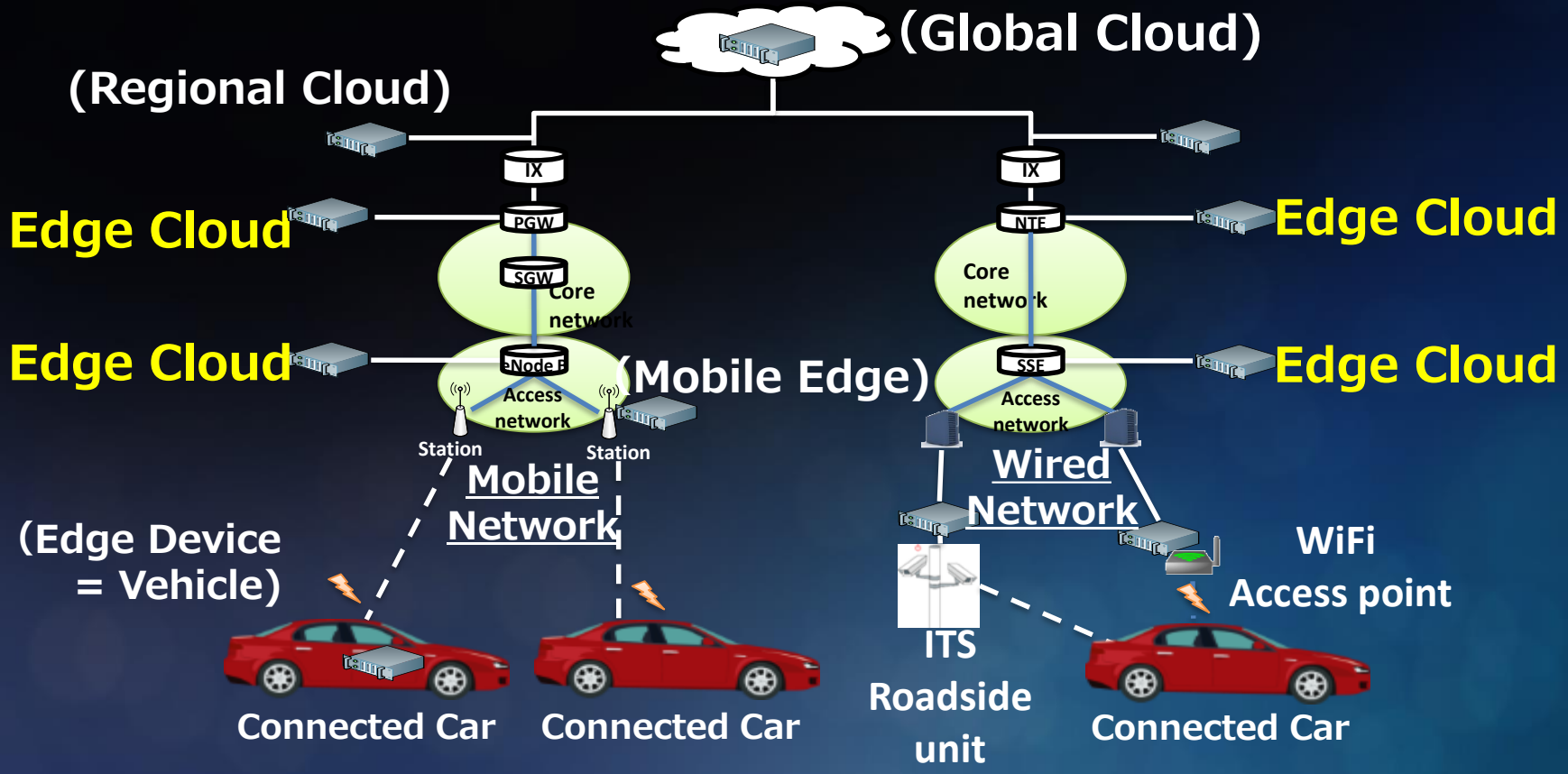
Edge Computing Technology



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AECC: Automotive Edge Computing Consortium

- **Standardizing (mobile) network infrastructure for handling huge vehicle data**
- **The consortium was established for discussing about edge computing technology for vehicle use-cases**

【Sponsor Member Companies】

- Cisco
- DELL
- Denso
- Ericsson
- Intel
- KDDI
- NTT
- Samsung
- Toyota

Currently 25 members

htpps://aecc.org

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Enterprise data vs. IoT data

	Enterprise System	IoT System
Data format	Fixed	Varied
Data meaning	Standardized	Varied
Value of data/bit	High	(Raw) Low (Analyzed) High
Data flow	Mostly down stream	Mostly up stream
Data volume	Low-Middle	(Raw) High-Huge (Analyzed) Middle
# of type of computation	Many	Small
Computation	Generic	Specialized

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Analysis of Vehicle & its environment

Low power
Scalable
Specialized
(=Customizable)

Collection,
Store, Analyze

DC

IoT
Network

Low power
Long life
Scalable
High performance/W

Edge
Computing

5G

Low power
Long life
High performance/W
Real-time

Real-time Feedback

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