

DENSO

Connected and Automated

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Executive Vice President
Engineering Division
DENSO International America, Inc.

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The Future of Connected Driving



Worldwide Traffic Accident Situation

Daily

More than
3,000 People

Yearly

1.3 Million
People

Annual Traffic Fatalities by Nation [Thousand People]

	1996	2009	Change
Japan	9.9	4.9	-50%
U.S.	42.1	30.8	-27%
EU 27 Countries	59.4	38.9	-35%
China	73.7	67.8	-9%
India	74.7	114.4	+53%
South East Asia	32.2	36.5	+13%
Brazil	30.0	34.0	+70%

Our mission is to reduce traffic fatalities by utilizing safety technology

DENSO's Long-term Plan 2025



Preserve the Planet

Significantly Improve fuel economy, reduce CO2 emission and reduce overall energy consumption

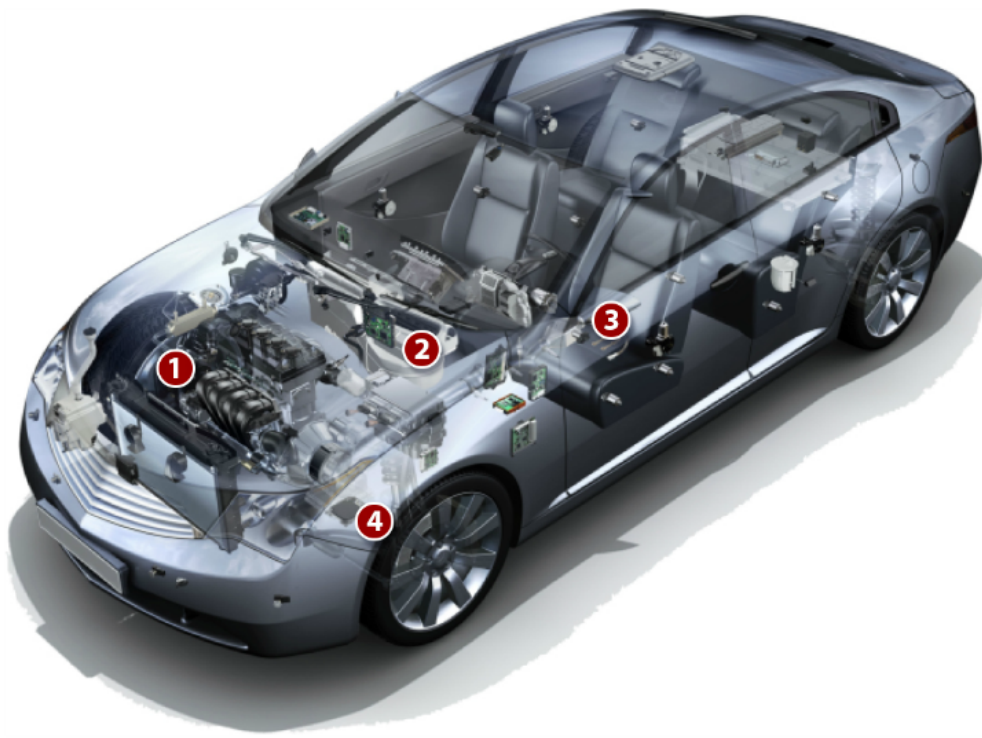


Protecting Lives

Greatly increase safety and security on and off the road
Strive for zero accidents

DENSO

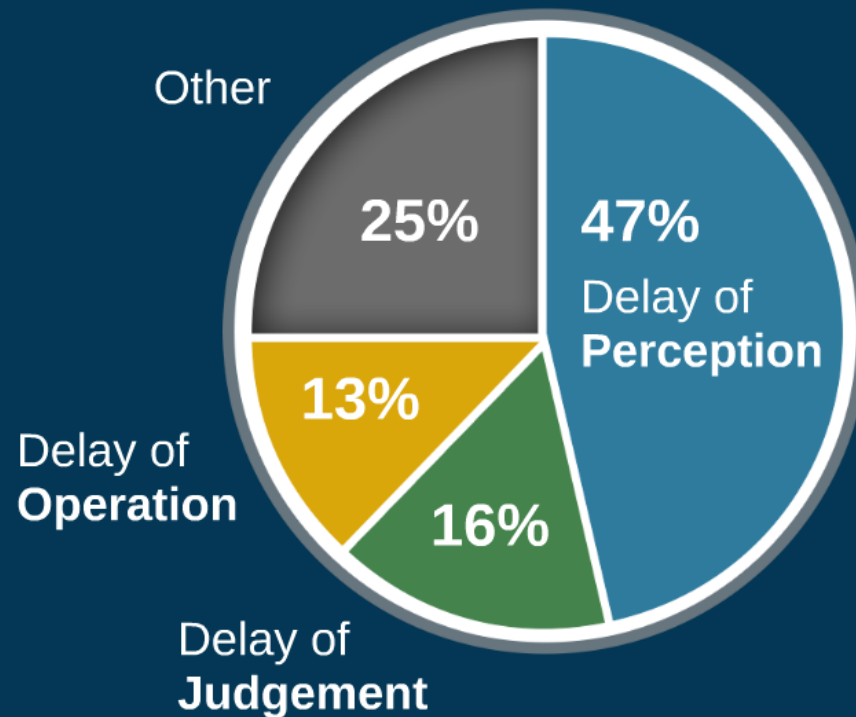
Global Supplier of Advanced Automotive Technology, Systems and Components with



Systems Provider

- 1 *Powertrain Control System***
Engine management system, Gasoline direct injection, Hybrid components, Starter, Alternator, etc.
- 2 *Thermal Systems***
Heating Ventilation Air Conditioning (HVAC), Compressor, Heat exchangers, Battery thermal management, etc.
- 3 *Information & Communication Systems***
Instrument Cluster, Head-up Display, Human Machine Interface technologies, Horn, Keyless entry, Wireless phone charger, etc.
- 4 *Driving Control & Safety Systems***
Passive safety technologies, Airbag sensing system, Active safety technologies, Traction control system, Antilock braking system, etc.

Why Traffic Accidents Occur?



75%

of accidents occurred due to erroneous perception/judgement/operation

Technology to assist the driver in perception, judgement and operation is **critical**.



Level 0

No Automation
Driver is in complete and sole control of brakes, steering, throttle, and motive power at all times.

Level 1

Function-Specific Automation
Automation of one or more functions: electronic stability control or pre-charged brakes.

Level 2

Combined Function Automation
Automation of at least two functions, for example adaptive cruise control and lane centering steering.

Level 3

Limited Self-Driving Automation
Automation that takes over all safety-critical functions under certain traffic conditions. Driver is available for occasional control.

Level 4

Full Self-Driving Automation
Vehicle can perform all safety-critical driving functions for an entire trip.

DENSO IS LEADING THE WAY

with innovative solutions for tomorrow

Image Sensor



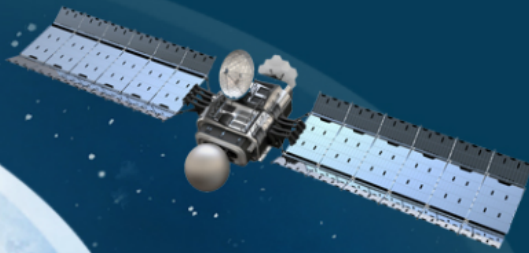
Millimeter-Wave Radar



V2X

Cloud

Satellite



Sonar



HUD



Cockpit System



V2X Onboard Unit



DCM



Navigation

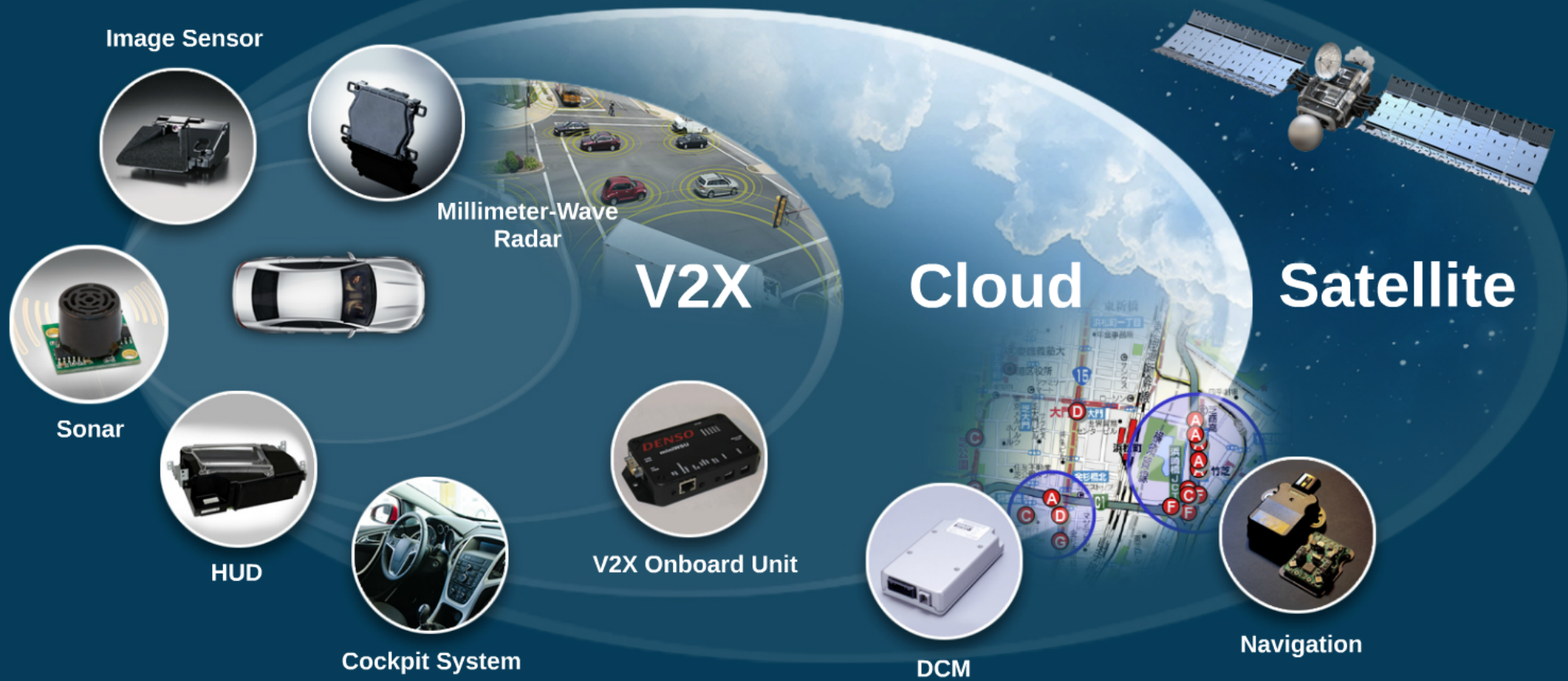




**Driver
in/out
of Loop**

**Driver
Condition/
Awareness
Key**

DENSO IS LEADING THE WAY with innovative solutions for tomorrow



In Production



FCW, LKA Software



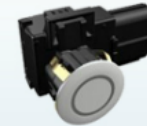
Vision Sensor (camera)



LIDAR



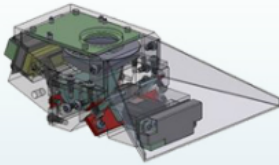
Millimeter Wave Radar



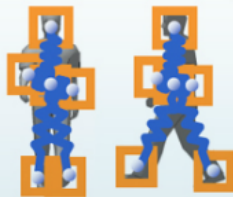
Sonar



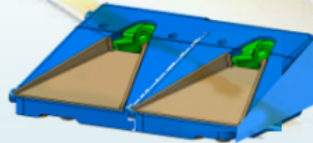
Next Generation



Next Gen Front LIDAR



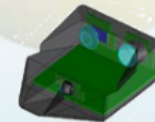
Pedestrian Detection



Mini Stereo Camera



Next Gen LIDAR Surround



LIDAR +Camera

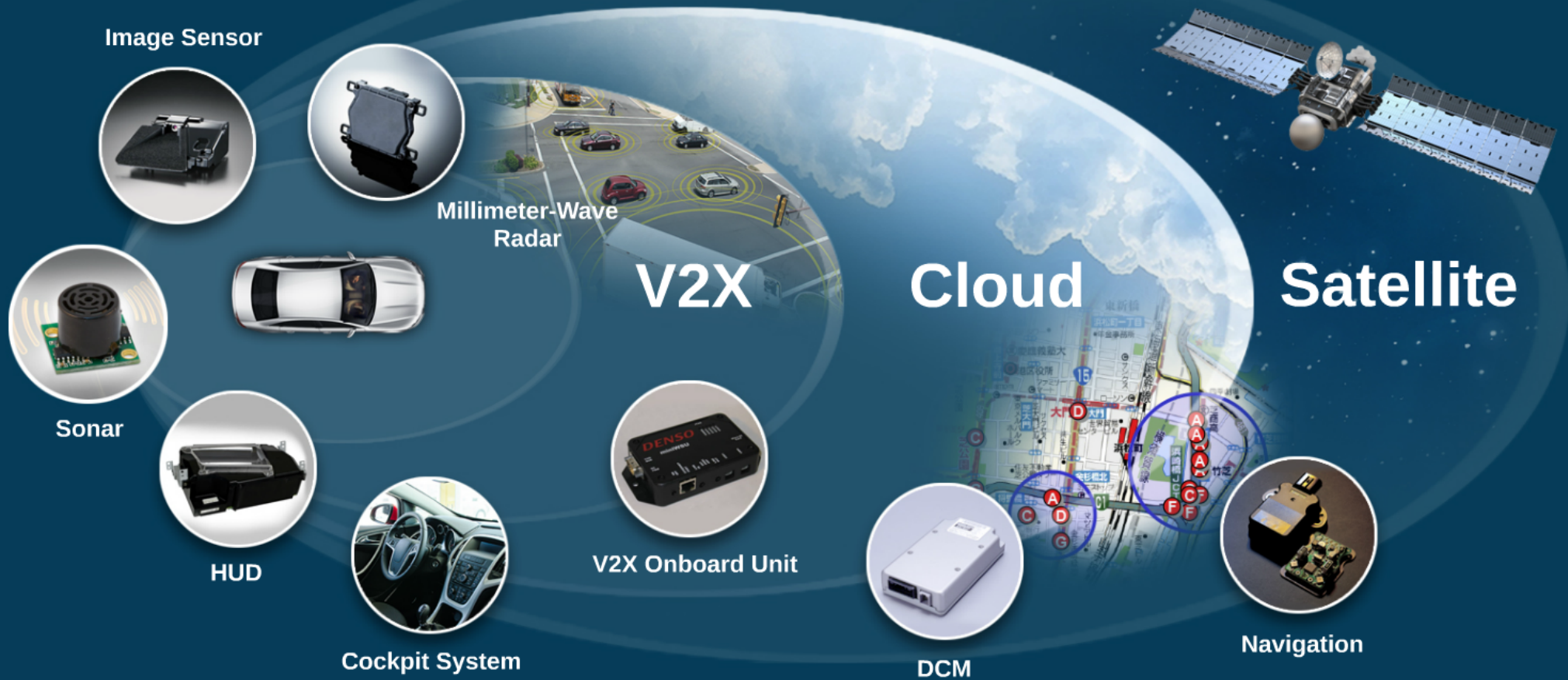


3D Flash LIDAR



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with innovative solutions for tomorrow





DENSO
V2X
BE CONNECTED. BE SAFE. BE GREEN.

Vehicle-to-Vehicle and Vehicle-to-Infrastructure

Real-time information beyond line of sight

- Working on V2X technology since 2003
- DENSO is providing V2X hardware to the USDOT's Model Deployment in Ann Arbor, Mich. and other field tests around the world.

DENSO IS LEADING THE WAY with innovative solutions for tomorrow

Image Sensor



Millimeter-Wave
Radar



Sonar



HUD



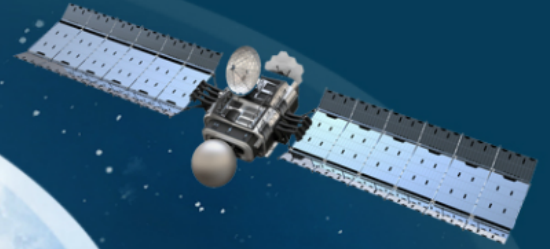
Cockpit System



V2X Onboard Unit



DCM



Satellite



Navigation

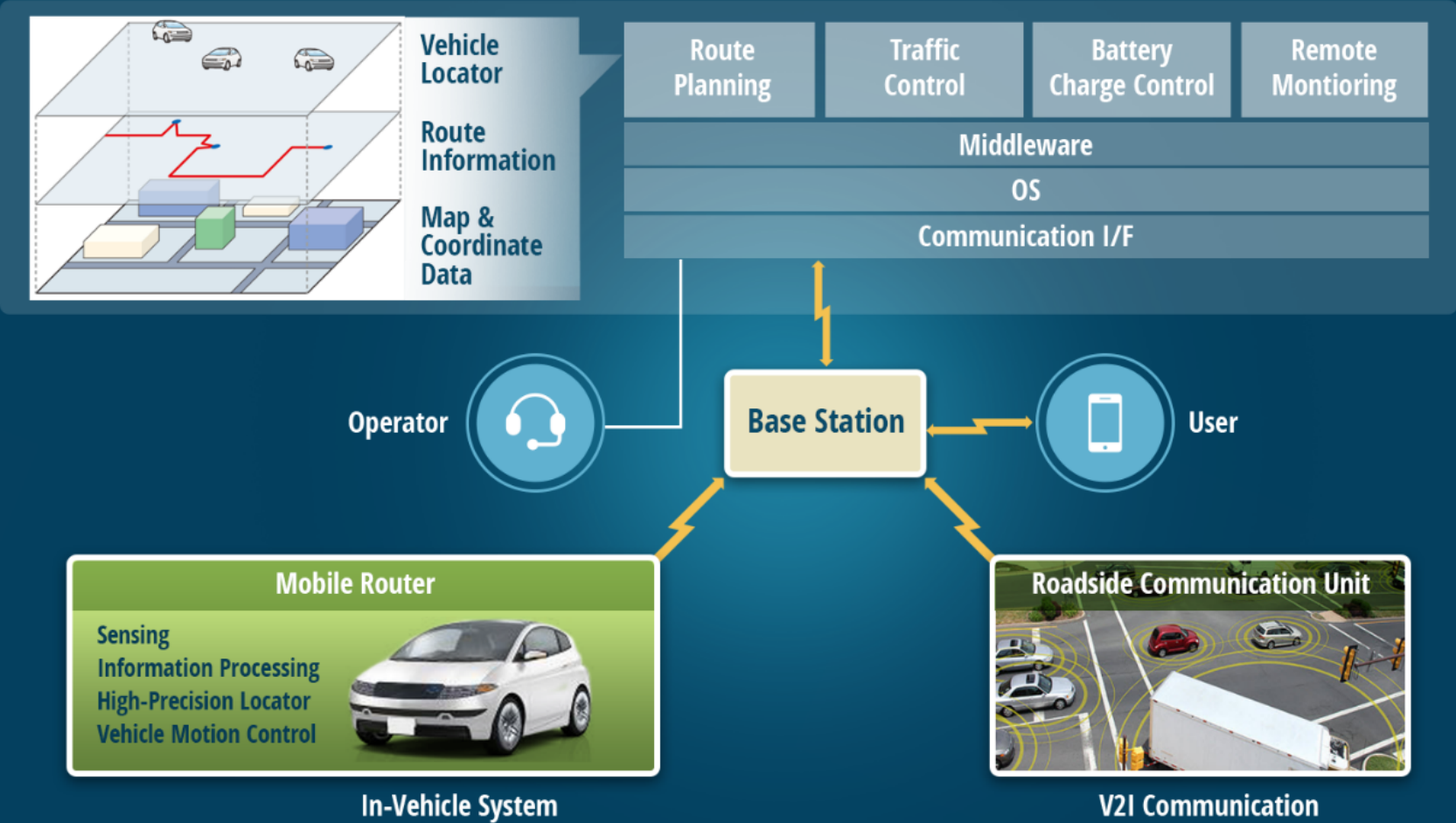
V2X

Cloud



Technological Concept of Traffic Control System

Road Traffic Control Center



Challenges we Face as an Industry



Safety



Information

DENSO IS LEADING THE WAY with innovative solutions for tomorrow

Image Sensor



Millimeter-Wave
Radar



Sonar



V2X

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HUD



Cockpit System



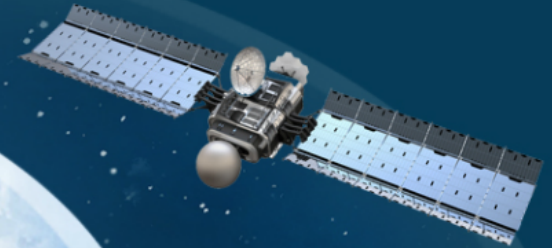
V2X Onboard Unit



DCM



Navigation





Full map

Channel

11:44

Map Coordinates

NAV

DEST

RPT

FAV

AUDIO

MENU

D>SEEK

K<SEEK



0.4 mi

300 ft

Mark

Go

POI



DOLBY DIGITAL dts Digital Surround

DVD

AUTO



74°F

74°F



PASS



The Future of Connected Driving



Thank You