Industry 4.0 & Transport for Digital Infrastructure

World Bank & KOTI Workshop

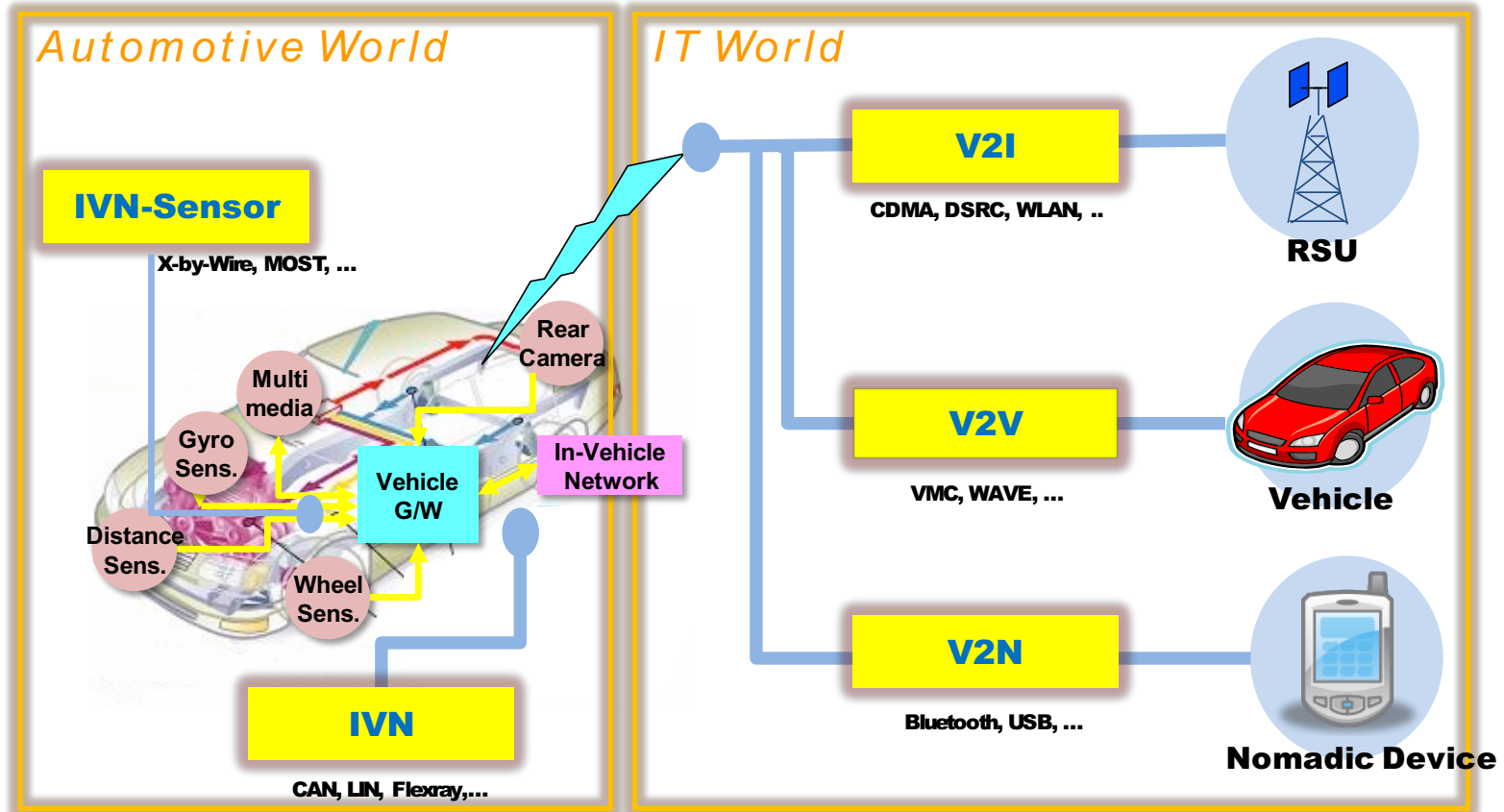**Jul. 211, 2017**

Young-Jun MOON, Ph.D., Chief Director

The Korea Transport Institute (KOTI)
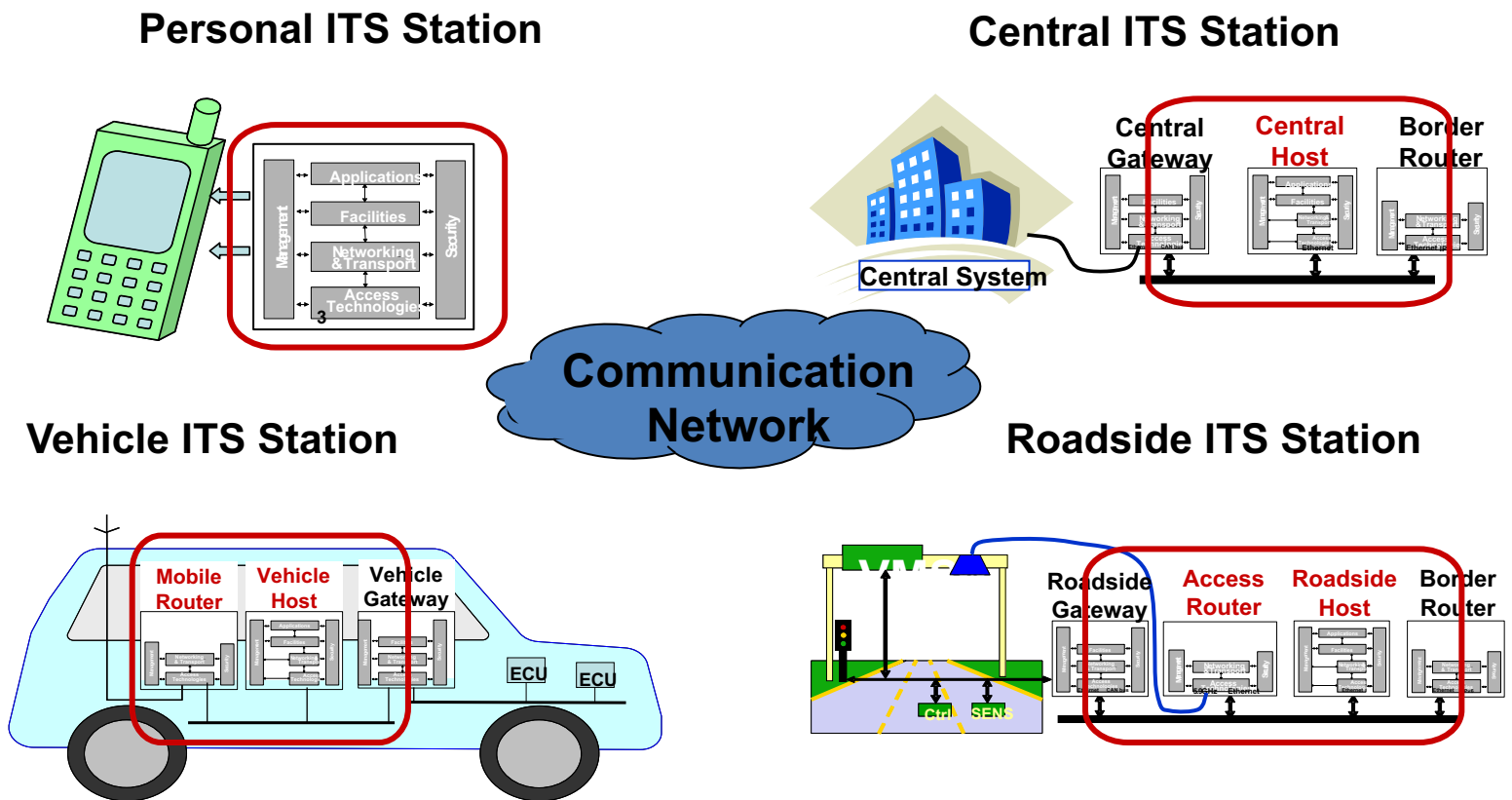
ISO/TC204 WG17 Convenor

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ICT changes Transport

◆ **Vehicle to Anything Connectivity (V2X)**

Automotive World

IVN-Sensor

X-by-Wire, MOST, …

Rear Camera

Multi media

Gyro Sens.

Distance Sens.

Wheel Sens.

Vehicle G/W

In-Vehicle Network

IVN

CAN, LIN, Flexray,…

IT World

V2I

CDMA, DSRC, WLAN, ..

RSU

V2V

VMC, WAVE, …

Vehicle

V2N

Bluetooth, USB, …

Nomadic Device

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ICT changes Transport

❖ **Cooperative ITS (C-ITS) based on V2X : ISO/TC204**

Personal ITS Station

Central ITS Station

Communication Network

Vehicle ITS Station

Roadside ITS Station

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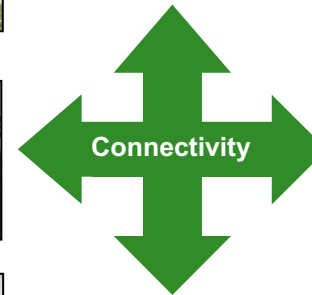한국교통연구원

ICT changes Transport

- **Super Connectivity in Smart Cities**
  - **Connectivity between**
    - **Vehicles**
    - **Infrastructure**
    - **Drivers**
    - **Nomadic Devices**
  - **Communications**
    - **Citizen**
    - **City**
    - **Anywhere, anytime, ..**

Drivers/Operators

Vehicles and Fleets

Connectivity

Infrastructure

Wireless Devices

Source : US DOT

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ITS vs. Next Generation ITS
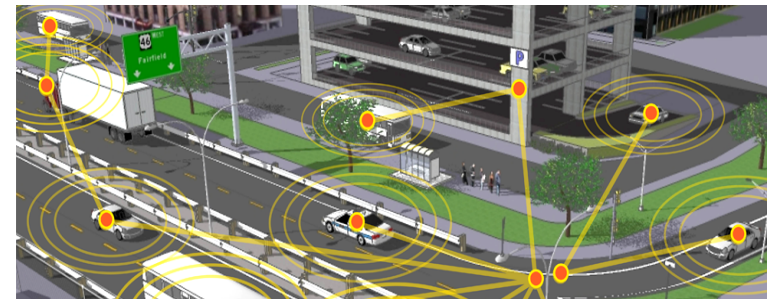
Intelligent Transport Systems (ITS)
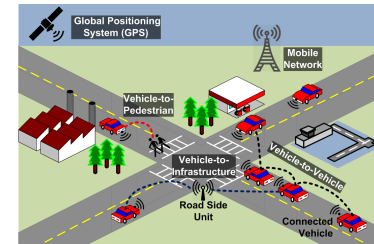(1990s-2010s)
Information Collection & Provision
- Vehicle Detection System (VDS)
- Road Surveillance & Monitoring
- Variable Message Signs (VMS)
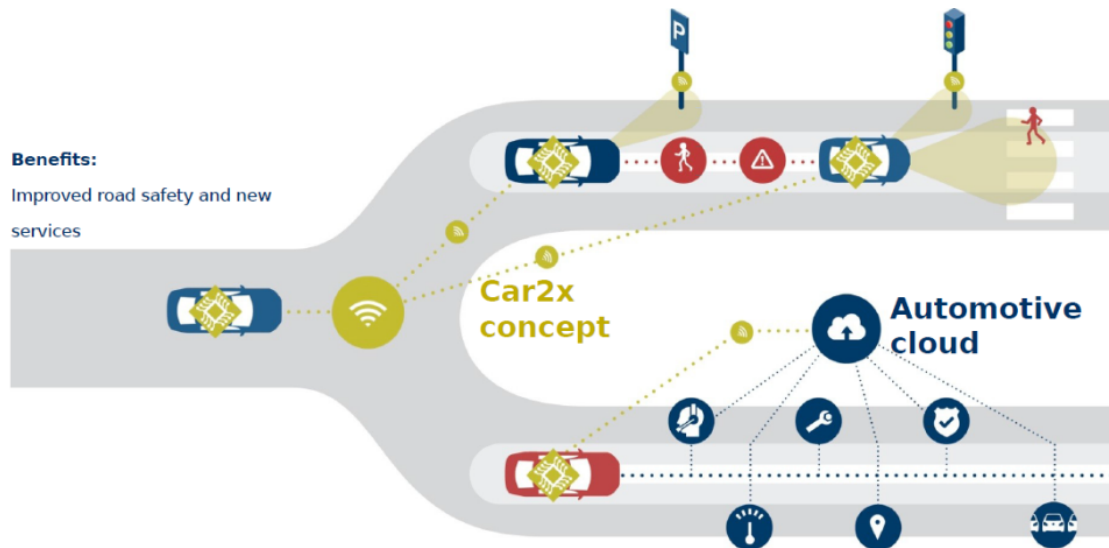
ITS for Next Generation
(2020s-2040s)
Citizen and City Super Connectivity
- **Digital Infrastructure** by V2X
- Mobile & Nomadic Devices
- Smart Mobility in Smart Cities

Digital Infrastructure

- ## Intelligent & Sensor-based Infrastructure
    - ### V2X and Automotive Cloud Information & Management
    - ### Connected & Automated Driving, Mobility Integration, Smart Cities

Sources : USDOT, 2014

Digital Infrastructure

Technology convergence will revolutionize transportation, dramatically improving safety and mobility while reducing costs and environmental impacts
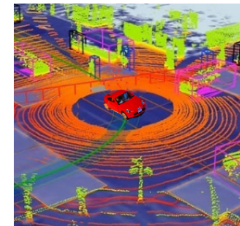
Connected Vehicles

Vehicle Automation

Connected-Automated Vehicles

Internet of Things

Machine Learning

Big Data

Mobility on Demand

Smart Cities

Sources : USDOT, 2015

Benefits

- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov't and users
- Improved accessibility and mobility

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Digital Infrastructure
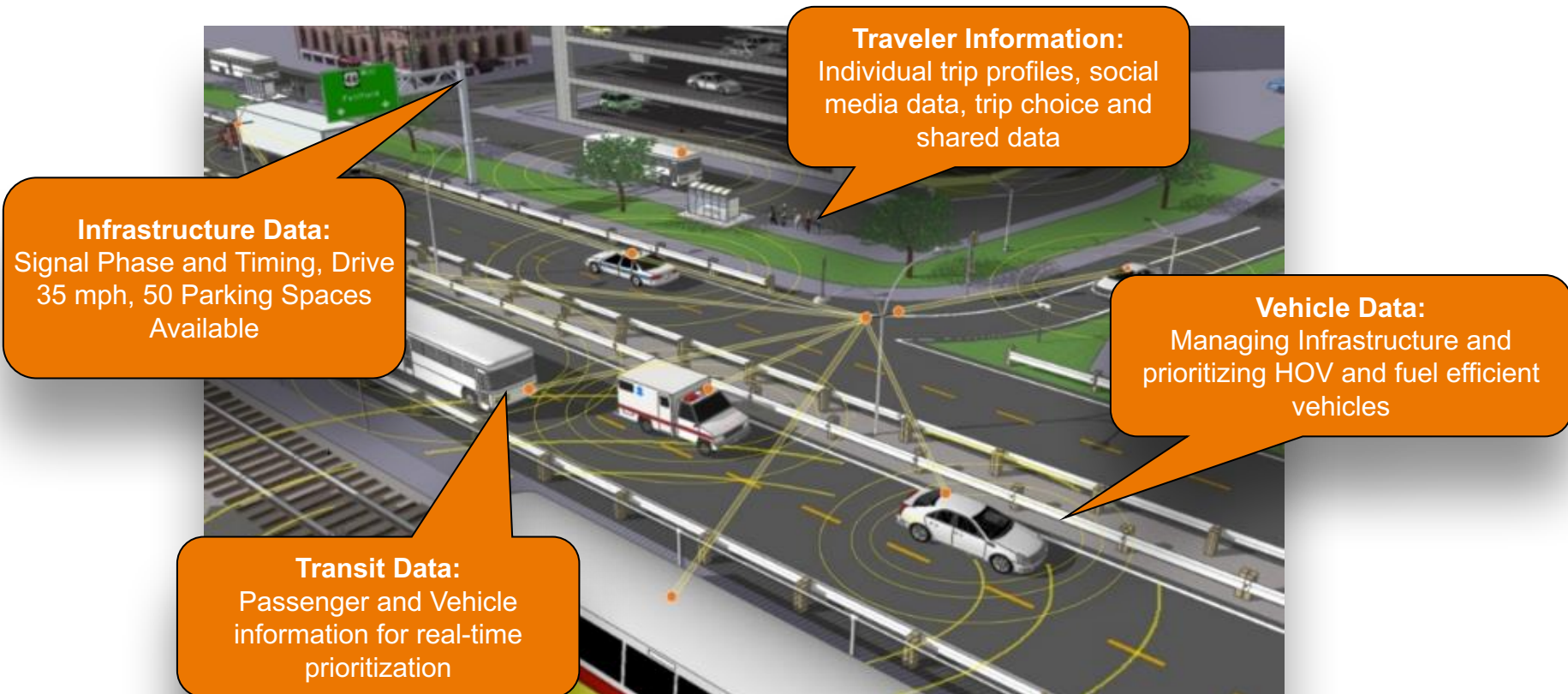
◆ **Level of Automated Driving & Digital Infrastructure**

  ✓ *Vehicle Automation*
  ✓ *Digital Infrastructure by ITS for Next Generation*

	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
SAE	No Automation	Driver Assistance	Partial Automation	Conditional Automation	High Automation	Full Automation
NHTSA	No Automation	Function Specific Automation	Combined Function Automation	Limited Self-Driving Automation	Full Self-Driving Automation	
Digital Infra.	Vehicle & Road Assisted ☞ **ITS**		Vehicle & Road Connected (V2X) ☞ **Cooperated ITS (C-ITS)**		Vehicle & Road Fully Networked ☞ **Automated ITS (A-ITS)**	

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Digital Infrastructure

- **Automated ITS (A-ITS) for Level 4 & Smart Cities**
  - **Traffic Management & Control based on Big Data & AI**

Traveler Information: Individual trip profiles, social media data, trip choice and shared data

Infrastructure Data: Signal Phase and Timing, Drive 35 mph, 50 Parking Spaces Available

Vehicle Data: Managing Infrastructure and prioritizing HOV and fuel efficient vehicles

Transit Data: Passenger and Vehicle information for real-time prioritization

Sources : AUVSI 2014, San Francisco

Thank you very much!

See you next year with

"*Digital Infrastructure and Smart Cities*"!

Young-Jun MOON, Ph.D. Chief Director

Dept. of National Transport Technology R&D

The Korea Transport Institute (KOTI)

ISO/TC204 WG17 Convenor

yjmoon@koti.re.kr